A 51-year-old right-handed female awoke with weakness of her left face, arm and leg, in addition to a right gaze preference and dysarthria. In the emergency department she was diagnosed with a right middle cerebral artery stroke and the stroke team was consulted. Her right hand and forearm was also noted to be cool, purple and painful to touch. Although she had a two-day history of nausea, emesis and diarrhea; she denied any trauma, shortness of breath or pain in her back, chest or neck. She was previously healthy with no history of arterial or venous thromboembolism including deep venous thrombosis, pulmonary embolism or miscarriage. No vascular risk factors were identified and her family history was unremarkable.

On examination, her blood pressure was 175/80 mmHg in the right arm and 190/85 mmHg in the left. Right ulnar and radial pulses were not palpable at the wrist or elbow. The right hand was tensely swollen, discoloured, cool and tender to palpation. On cranial nerve examination, there was no ptosis or miosis. There was a left gaze palsy, and a left facial droop. Motor examination revealed a dense hemiplegia on the left side. Reflexes were brisk on the left and her left toe was upgoing. The remainder of her neurological examination was unremarkable.

Routine investigations were normal, including hemoglobin, platelets, international normalized ratio (INR), partial thromboplastin time (PTT), chest x-ray, and electrocardiogram. Computed tomography (CT) of the brain showed a recent large right middle cerebral artery stroke with a dense middle cerebral artery sign (Figure 1). Concern regarding the right hand findings led to an urgent angiogram of the right arm. A large 1.5cm mobile mass was identified in the brachiocephalic artery. Furthermore, there was reduced flow to the right subclavian artery and the right common carotid artery extending into the bifurcation of the internal and external carotid arteries (Figure 2).

The patient underwent an urgent surgical embolectomy of the brachiocephalic artery, the right brachial artery and the right carotid artery. Distal control was achieved by introducing a Fogarty catheter distal to the carotid thrombus via the right internal carotid artery. It was advanced proximally toward the aorta, and the thrombus was extracted. Thrombus was also extracted from the brachial artery by introducing a Fogarty catheter just above the level of the bifurcation of the brachial artery. The thrombus was sent for pathologic evaluation and no evidence of malignancy or infection was identified. The patient did not experience any complications from the procedure. The patient was started on anticoagulation following the procedure. Despite being on coumadin with an INR of 2.6, the patient developed recurrent right arm ischemia six days later and required repeat right brachial artery embolectomy with the
addition of 5mg tissue plasminogen activator (tPA) in each of the
distal ulnar and radial arteries. During surgery, the patient was
noted to form clot very readily despite a therapeutic INR. She
tolerated the procedure well.

A work up for a hypercoagulable state was negative including
antiphospholipid antibodies, hyperhomocystenemia, proth-
rombin gene mutation, antithrombin III deficiency, factor V
Leiden, factor VIII deficiency, factor IX deficiency, factor XI
deficiency, fibrinogen, protein C deficiency and protein S
deficiency. A transesophageal echo (TEE) revealed a small
patent foramen ovale (PFO) with no atrial septal aneurysm. No
evidence of venous thrombosis was identified on lower
extremity ultrasound or CT chest. A screen for malignancy was
negative, including CT chest-abdomen-pelvis, abdominal
ultrasound and carcino-embryonic antigen (CEA) levels. The
patient was discharged home on coumadin and aspirin. She had
full function of her right upper extremity within two weeks of the
interventional therapies. Her left sided hemiplegia showed
gradual improvement with rehabilitation.

**DISCUSSION**

The initial assessment of stroke patients is often the most
critical period with regards to urgent investigation and potential
treatment. In stroke patients there are often associated medical
conditions that can be identified, particularly in the young stroke
patient. A patient presenting with contralateral hemiplegia with
an ipsilateral cool, pulseless hand suggests a process affecting
multiple vascular territories. Diagnostic considerations include a
proximal vascular lesion such as an aortic dissection and a
pseudoaneurysm of the brachiocephalic artery. An aortic
dissection must be considered in any patient presenting with
asymmetry of peripheral blood pressures and/or pulses and
although aortic dissection classically presents with sharp chest or
abdominal pain, there are reports of painless aortic dissection,
presenting only with neurologic dysfunction and a widened
mediastinum on chest x-ray. Pseudoaneurysm of the brachio-
cephalic artery is an uncommon vascular lesion related to trauma
or first rib impingement. It has been reported to cause left
hemiplegia and right upper extremity ischemia. Our patient
had no clinical or radiographic evidence of an aortic dissection
or a brachiocephalic pseudoaneurysm.

Cardiac emboli to multiple vascular territories is an important
consideration and sources of cardiac arterial emboli include
cardiac arrhythmias such as atrial fibrillation and atrial flutter,
valvular lesions seen in endocarditis, and cardiac muscle lesions
such as acute anterior myocardial infarction. A defect in the
cardiac septum such as a large PFO, can cause a paradoxical
embolism of venous thrombus into the arterial system and a case
report with a large PFO has described a similar presentation. Our
patient had a small PFO with no evidence of venous
thrombosis, and no other identified cardioembolic source.

Certain hypercoagulable states can also cause arterial
thrombosis in multiple territories, including antiphospholipid
antibodies, hyperhomocystenemia, and paroxysmal nocturnal
hemoglobinuria. Malignancy can also cause a hypercoagulable
state through a low grade disseminated intravascular coagul-
opathy which shifts the coagulation cascade towards clotting.
The hypercoagulable state can lead to thrombus formation
throughout the vascular system, particularly involving the heart

![Figure 2: Arch aortogram showing a 1.5cm filling defect of the proximal
brachiocephalic trunk that appears mobile. Distal branches showed
delayed filling. The left common carotid, subclavian and vertebral
arteries appeared normal. The left vertebral artery was dominant.](image-url)
either by propagating the right carotid artery thrombus distally into the right internal carotid artery and middle cerebral artery or by precipitating a retrograde embolism from the right common carotid artery to the right vertebral artery. Surgical embolectomy was successful and did not result in further embolic events in our patient. This may have been due to both good distal control during the procedure and a dominant left vertebral artery, minimizing the risk of a retrograde embolism.

In our patient, the most important aspect of her investigation and management involved the early and accurate examination. Stroke patients often present to the hospital with coexisting medical conditions. Careful assessment is required to identify medical conditions such as aortic dissection, carotid dissection, myocardial infarction and cardiac dysrhythmia. Careful assessment is also required to identify other acute medical issues that may require urgent investigation and management, such as other tissue ischemia. In our young patient early detection of critical examination findings led to surgical intervention that effectively saved her ischemic right arm and prevented bilateral upper extremity functional impairment.

**REFERENCES**