

Strategies for Stroke

Ischemic stroke is a complex disease, the management of which involves features of cardiology, internal medicine and rehabilitative medicine. Is there a thorough, yet simplified, approach to acute ischemic stroke?

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Stroke is the fourth leading cause of death in Canada and is a leading cause of disability among adults.¹ Approximately 50,000 people per year suffer a stroke; of these, nearly 25% will die and 25% are left to live with a severe disability. The cost of stroke to Canada is well over \$3 billion per year.^{1,2}

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Approaching stroke

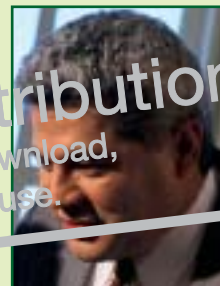
The approach to the acute or chronic stroke patient can be divided into six basic concepts (Table 1). Each category should be addressed in every individual patient, but not all interventions or investigations are applicable to every patient. Diagnosis and localization are critical, as there are other conditions that can present with ischemic stroke-like syndromes, including:

- intracerebral hemorrhage,
- hypoglycemia,
- epilepsy,
- systemic or central nervous system infection,
- migraine aura and migraine equivalent,

Raphaello's Case

Raphaello, 55, has a history of two myocardial infarctions, congestive heart failure, and a 40 pack per year history of smoking.

He presents to the emergency room with left homonymous hemianopsia, conjugate gaze deviation to the right, left facial droop, and left hemiparesis with sudden onset two hours ago. He denies any major problems.



For more on Raphaello, see page 28.

- panic attacks,
- conversion disorder,
- brain tumour and
- spinal cord disease.

Identification of gaze deviation, aphasia, neglect and hemianopsia allows some ability to characterize the event as cortical with large cerebral vessel involvement, as opposed to lacunar stroke involving small perforating vessels.

emergency department physician should contact the nearest acute stroke team if thrombolysis is possible. There are a number of important pre-thrombolysis requirements, including, but not limited to:

- an absence of contraindications to thrombolysis on history,
- a platelet count > 100,000/ml,
- blood sugar > 2.7 mmol/L and
- an international normalized ratio < 1.8.

Dialogue between the stroke team physician and the referring physician will establish whether brain CT and/or laboratory tests should be initiated pre-transfer or performed at the receiving hospital.

Thrombolysis

Given within three hours of ischemic stroke onset, tPA increases the chances of complete functional recovery by 12% (absolute) and 30% (relative). The number needed to treat to produce one complete functional recovery is 8.3. The risk of intracerebral hemorrhage is tenfold higher than in patients given placebo (6% versus 0.6%) and the treatment does not affect mortality in either direction.³ There is evidence that the treatment increases the chances of improvement in neurologic function, even in patients who do not experience complete functional recovery.⁸

Intravenous tPA is an effective medication for acute stroke that needs to be administered by experienced individuals because of treatment risks and the speed required in ruling out alternative diagnoses in the hyperacute period. Although the hemorrhage risk advises caution, the treatment is justified, given the overall functional gains and the devastating nature of the underlying disease.

More on Raffaello

Raffaello has deficits that localize to the right hemisphere. The presence of left homonymous hemianopsia and neglect or denial of his deficits suggests involvement of cerebral cortex rather than subcortical structures in isolation. The concomitant presence of severe weakness, gaze deviation, hemianopsia and neglect suggests involvement of the entire right middle cerebral artery territory, likely from an ischemic stroke; however, intracerebral hemorrhage could mimic this presentation and cannot be ruled out on clinical criteria.

Raffaello's brain CT scan shows no early infarct signs or hemorrhage. There is a hyperdense middle cerebral artery sign on the right side, suggesting a large thrombus within the vessel (Figure 1).



Figure 1. Raffaello's brain CT showing the hyperdense middle cerebral artery sign (white arrows) representing thrombus within the right middle cerebral artery itself. The finding is often associated with extensive infarct and a poor prognosis.

What should be done? For the answer, see page 29.

About the author...

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Treating Raffaello

Raffaello is presenting within the critical three-hour window for ischemic stroke treatment with recombinant tPA. He should be evaluated by a physician within 10 minutes of arrival at the emergency room.

Intravenous thrombolysis is administered. Raffaello is sent to an observation unit for monitoring for at least 24 hours. The nurse calls because of a BP of 195/95 mmHg.

What are your recommendations regarding blood pressure? What other management or investigation does Raffaello require? See page 30.


Following up

Etiology requires selected investigations based on a patient's presenting characteristics and medical history and will guide medical treatment decisions.

The prevention of stroke recurrence involves controlling all relevant general vascular risk factors, as well as managing specific risk factors, such as:

- hypercoagulable states,
- high-grade carotid stenosis,
- carotid or vertebral artery dissection and
- atrial fibrillation.

The prevention of medical complications centres around avoidable medical problems that can sometimes produce more morbidity than the underlying stroke itself. Deep venous thrombosis and aspiration pneumonia are the major sources of mortality after stroke and are relevant in our patient, Raffaello, who has a moderate-sized stroke. Frequent turning, usually every two hours, and proper skin hygiene avoids skin breakdown and prevents decubitus ulcers.


Rehabilitation is critical to optimize functional outcome; all stroke in-patients should have at least some access to physical therapy, speech therapy and occupational therapy. 

Blood pressure guidelines

In general, BP guidelines in the acute period are based on expert opinion, case series and animal data suggesting that ischemic injury increases with reductions in BP within the first seven to 10 days post-stroke.⁹ For most ischemic stroke patients, existing guidelines do not suggest BP lowering unless:

- the systolic BP is greater than 220 mmHg,
- the diastolic BP is greater than 120 mmHg or
- there is other target organ damage requiring a lower BP.¹⁰

In intracerebral hemorrhage, a lower BP target of < 180/110 mmHg is advised.¹⁰ BP targets post-thrombolysis for ischemic stroke were determined by the National Institute of Neurological Disorders Study inclusion criteria and advise a pre-thrombolysis BP of 185/110 mmHg and a post-thrombolysis BP of 180/105 mmHg.^{3,10}

Cont'd on page 30 

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Raphaello's Followup

Raphaello's blood pressure is too high post-thrombolysis, and intravenous labetalol is suggested as the initial agent to lower it.

Raphaello experiences a partial improvement in his symptoms with resolution of his neglect and hemianopsia, but also experiences residual facial droop, moderate leg weakness and moderate arm weakness.

Raphaello had a stroke in the carotid artery territory and may be a carotid endarterectomy candidate; therefore, carotid ultrasonography is required.

Similarly, a holter monitor is reasonable to assess for atrial fibrillation and, given his history of cardiac disease, echocardiography would be a consideration.¹¹

Complications of Raphaello's weakened shoulder and arm include frozen shoulder from immobility and adhesive capsulitis, which can be prevented with range of motion exercises. Traction from the weight of a paretic or neglected arm can produce brachial plexus damage and glenohumeral subluxation and can be prevented by supporting the arm's weight with pillows or wheelchair boards to oppose the action of gravity.

Given his neurologic deficits, Raphaello will benefit from more intensive in-patient rehabilitation.



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