

Strategies to consider: telestroke and 24-hour primary stroke centres

Introduction to Hong Kong's stroke management

The stroke team in Hong Kong only performs duty during office hours due to limited resources,¹ but 57% of strokes occur during non-office hours (from Queen Elizabeth Hospital [QEH]; data unpublished). Queen Elizabeth Hospital, the only hospital with 24-hour stroke service, treats roughly 1800 patients a year (QEH; data unpublished). Since there are approximately 18 000 stroke patients annually, this amounts to a whopping 9234 or so of stroke patients unable to receive immediate care. In developing countries like Pakistan, 25% of stroke patients arriving at one hospital within the recommended 3-hour time frame² were eligible for recombinant tissue plasminogen activator (rtPA) treatment, but as of 2011, only 10% of Hong Kong stroke patients were able to achieve that (QEH; data unpublished). This rate has not been improved since 1999,³ rendering new measures necessary.

Problems are inherent in our delivery of stroke care. One of the more noticeable problems is the policy pertinent to ambulance transfers. Most patients are sent to the closest hospital regardless of the circumstances, thus patients outside QEH's jurisdiction zone and outside office hours have their rights to receive rtPA treatment expropriated. If measures that could divert patients directly into their relevant centres, such as trauma diversion, are implemented for stroke patients, the number of stroke patients eligible for rtPA could increase. A second problem is the delay in patient delivery, which could be explained on two grounds. Patients are either too uneducated to recognise stroke symptoms, and/or stagnation in intrahospital triage and door-to-needle logistics. For whichever reason, effort to promote stroke awareness in our population is imperative, and other measures to improve door-to-needle time (DNT) should also be considered to improve the current dire situation.

Despite recommended clinical guidelines for rtPA, delivery of rtPA in Hong Kong has been poor. In a study by Lau et al¹ to evaluate the time needed to provide thrombolytic therapy, the stroke team on average was notified 33 minutes later than the time recommended by the National Institute of Neurological Disorders and Stroke, and the DNT was 80 minutes—20 minutes longer than the benchmarked 60 minutes. Similar studies in India and Taiwan have average DNTs of 50 minutes⁴ and 67 minutes⁵ respectively. The sluggishness of Hong Kong's hospital logistics is well-reflected in this

study. United States is not much better with a DNT of 78 minutes,⁶ but that country has launched stroke programmes such as Target: Stroke to reduce DNT to less than 60 minutes.⁷ Hong Kong has yet to launch programmes with similar chief objectives.

Lessons from the West

Patients with wake-up stroke

One of the difficulties physicians often encounter is the uncertainty involved in patients with wake-up stroke (WUS), which incontrovertibly hampers physicians' ability to diagnose eligibility for rtPA treatment. Approximately 14 to 28% of ischaemic stroke patients belong to this category.⁸ Patients with WUS do not have a clear time of onset and are classified as outside the therapeutic window for thrombolytic treatment. Therefore, they are considered unsuitable for thrombolytic therapy. However, a study on the off-label use of thrombolytic therapy in WUS patients suggests that rtPA may be beneficial for this population.⁸ Magnetic resonance imaging (MRI) diffusion-perfusion mismatches were similar between WUS patients and patients with known onset, suggesting most WUS may occur upon awakening.⁹ If proper neuroimaging procedures such as MRI, computed tomographic perfusion, and computed tomographic angiography can be incorporated into our existing management, then subgroups of WUS patients eligible for reperfusion might be identified, and more could receive thrombolytic treatment upon presenting with an acute ischaemic stroke (AIS).

Another possible solution to ameliorate the problem is to extend stroke service hours in the morning. Hospitals have office hours starting at 9 am, which means only WUS patients with onset time at 6 am or later are eligible. Extending office hours to 6-8 am could translate into inclusion of a larger fraction of WUS patients receiving thrombolytic therapy within the 3-hour time frame.

Telestroke system

A possible solution to Hong Kong's limited resource is a telestroke system similar to other countries that have adopted the system, including: Canada, United States, Germany,¹⁰ and Finland.¹¹ In Canada for instance, Alberta¹² and Ontario's¹³ telestroke systems have been proven equally effective as on-site stroke specialist care. Advanced stroke care was provided both in the "spoke" and in the "hub". Other benefits of telestroke include the reduction of patients

transfers to tertiary stroke centres. Other reports too endorse the efficacy of telemedicine.¹⁴⁻¹⁶ The efficacy of telestroke is reassured by the American Stroke Association Expert Panel, which concluded there was level I grade A evidence that telestroke can be reliably performed in remote locations and level I grade B evidence that stroke specialists using videoconferencing techniques could provide a medical opinion on rtPA usage in the absence of an on-site specialist.^{17,18}

Queen Elizabeth Hospital is currently the only hospital in Hong Kong that provides 24-hour stroke services. It utilises a certain degree of telemedicine insofar that no videoconferencing is allowed and only phone calls and emails can be made. Moreover, the telemedical system was built to make it more convenient for physicians to provide consultations at home during non-office hours, as opposed to relaying consultations to hospitals inaccessible to 24-hour acute stroke services. However, telephone calls have been proven less efficacious and lead to more incorrect decisions than a complete telemedical system that includes videoconferencing.¹⁴ In Hong Kong, if a telestroke system were to be implemented, it may be suitable to execute a “drip and ship”¹⁷ system that will transport AIS patients from smaller hospitals (spokes) into QEH (a designated hub) after receipt of rtPA treatment.

24-Hour primary stroke centres in local hospitals

To increase access to rtPA use, the Brain Attack Coalition (BAC) advised the creation of primary stroke centres, with resources such as acute stroke team, carefully written care protocols, stroke units, neuroimaging, and most importantly 24-hour acute stroke services.¹⁹ To assess whether this claim could

materialise, a primary stroke centre was established in a community hospital located in the United States. Consequently, rtPA use was increased substantially and significantly from 1.5 to 10.5%.²⁰ Most hospitals in Hong Kong have stroke units but do not provide the recommended 24-hour neurological care. A lack of human resources including neurologists and radiologists is the likely reason, but ultimately resources will need to be invested or reallocated to reinforce thrombolytic therapy in stroke. Embracing BAC guidelines may serve as a possibility to increase rates of rtPA usage.

Summary

There is room for refinements in our existing management for AIS patients. For eligible AIS patients, rtPA is an effective therapy, but its under-use in Hong Kong is pronounced. A telestroke system may be one antidote to increase its utilisation, and could also decrease DNT. Establishing primary stroke centres with comprehensive diagnostic tools may resolve dilemmas with WUS patients, hasten stroke delivery, improve diagnostic accuracy, and ultimately benefit the entire population.

Declaration

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