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Stroke as a separate field of medicine

PERSPECTIVES

LARS THOMASSEN

lathom2@online.no
Lars Thomassen, specialist in neurology, professor emeritus at the University of Bergen, former senior consultant and head of the stroke unit at the Department of Neurology and now a researcher at the Division of Clinical Neuroscience, Haukeland University Hospital.
The author has completed the ICMJE form and declares no conflicts of interest.

MARTIN KURZ

Martin Kurz, specialist in neurology, professor II at the Department of Clinical Medicine, University of Bergen, senior consultant and head of the Neurology Centre at Stavanger University Hospital. He is head of the Norwegian Stroke Organisation.
The author has completed the ICMJE form and declares no conflicts of interest.

OLE MORTEN RØNNING

Ole Morten Rønning, specialist in neurology, professor II at the Division of Medicine and Laboratory Sciences, Institute of Clinical Medicine, senior consultant and head of Section for Acute Strokes, Division of Clinical Neuroscience, Akershus University Hospital. He is a board member of the Norwegian Stroke Organisation.
The author has completed the ICMJE form and declares no conflicts of interest.

Vascular neurology is different from general neurology, and in practice is a separate field of emergency medicine. Should formal qualifications and a defined framework for education in vascular neurology be introduced?

Illustration: Espen Friberg

Every year, around 10 000 people in Norway suffer a stroke, and approximately 60 per cent of these are treated at a neurology department (1, 2). Strokes are a widespread health problem in Norway; on a par with cardiovascular diseases and cancer. However, unlike these two conditions, there is no defined educational framework or specific competence requirements for the medical field of stroke. Rehabilitating patients with post-stroke sequelae has long been the main remit of stroke medicine (3). In parallel with the introduction of intravenous thrombolytic therapy, intraarterial thrombectomy and advanced diagnostic imaging in the investigation and treatment of acute cerebral infarction, general neurology has been expanded to include acute vascular neurology.

The acute chain

Time is of the essence when treating acute strokes, and an effective treatment chain needs to be in place (4)-(6). When a stroke *is suspected,* the patient is admitted to hospital. A number of pre-hospital differential diagnoses need to be ruled out, stroke mimics must be clarified, and the patient must be quickly transported by ambulance to the right place (7).

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In the emergency department, neurovascular, cardiovascular and internal medicine diagnoses also need to be considered in addition to neurological differential diagnoses. Acute radiological diagnostic imaging is used to support this work. The acute treatment chain upon admission to a neurology department requires close collaboration between neurologists and prehospital

services, emergency departments, radiologists and anaesthesiologists. Expertise in vascular neurology is needed at all stages (8–12). General neurology faces a challenge here. Vascular neurology is fundamentally different from general neurology; in general neurology, emergency situations are not commonplace, but in vascular neurology, every patient is an emergency. Is general neurology the right solution for addressing the needs of the acute chain?

The treatment

Thrombolysis and thrombectomy are the treatment options for acute cerebral infarction. The treatment indication is based on information about previous neurological function, acute neurological outcomes, the time frame of the treatment window, the site of the blood clot, collateral circulation, perfusion in the brain tissue and the extent of cell death. Potential treatment effect (arterial recanalisation and clinical improvement) must be weighed against possible adverse effects (cerebral haemorrhage and mortality). Appropriate treatment therefore requires robust knowledge of brain blood circulation and the pathophysiology of cerebral infarction, combined with an understanding of advanced neuroradiological diagnostics. Is the specialist training requirement for a two-day course on brain blood circulation an adequate basis for complex treatment decisions?

Stroke monitoring

When a patient arrives at a stroke monitoring unit, their cerebral circulation is unstable. In order to pre-empt clinical deterioration, general parameters such as heart function, blood pressure, lung function, oxygen saturation, temperature, blood sugar and fluid balance must be closely monitored, and cerebral circulation and haemodynamic parameters must be monitored by ultrasound (13, 14).

> ***«Is the specialist training requirement for a two-day course on brain blood circulation an adequate basis for complex treatment decisions?»***

Patients with cerebral haemorrhage or malignant cerebral oedema need special monitoring, and potentially neuro-intensive treatment. If indicated, a neurosurgeon needs to be involved. In general neurology, electrophysiological monitoring of the brain (EEG) is left to specialists in clinical neurophysiology, while in vascular neurology, circulatory physiological monitoring (ultrasound) must be performed by a vascular neurologist (15). In general neurology, monitoring heart function, blood pressure, lung function, oxygen saturation,

blood sugar and fluid balance is not a key task, but in vascular neurology it is part of the daily routine. Should general neurologists deal with complicated clinical monitoring without specialist training?

Neurovascular laboratory

Repeated radiological examinations such as CT or MRI are not suitable for monitoring. Transcranial ultrasound, however, can be used in wards during ongoing general monitoring. This can be repeated frequently without any significant burden to the patient and can provide dynamic information about changes in cerebral circulation (15). However, the theory and practice of clinical neurosonology are challenging, and a high level of specialist competence is a prerequisite for performing examinations (16, 17). Nevertheless, the specialist training in general neurology does not include any recommendations for training in clinical neurosonology. Is this a satisfactory competence framework for such a specialised field?

The stroke unit

The time and degree of mobilisation and training must be carefully considered in order to avoid negative repercussions as a result of rehabilitation (18). In this context, the rehabilitation tradition in general neurology can be drawn on. Further investigation and etiological clarification, however, take a different course from general neurology, and include hypertension, diabetes mellitus, hyperlipidaemia, atrial fibrillation and other heart diseases. A high number of other risk factors and etiological differential diagnoses are seen in young patients in particular. The choice of secondary prophylactic treatment thus becomes correspondingly complicated (19, 20). Is general neurology a good enough basis for appropriate management of internal medicine issues and rare vascular diseases?

The outpatient clinic

In preventive treatment and in the follow-up after a stroke, neurologists' work includes both cardiovascular and neurovascular medicine. Patients with subclinical atherosclerosis or vascular cognitive impairment, with a transient ischemic attack (TIA) or a 'silent infarction' accidentally detected in a CT or MRI scan, require the same assessments and preventive treatment as acute stroke patients (21, 22). Outpatient issues are often the same as those outlined in the sections on stroke monitoring, neurovascular laboratory and the stroke unit. General neurology without specialist vascular competence also appears to be an inadequate offer for stroke patients in an outpatient context.

Quality in all parts of the chain?

Norway's clinical guidelines for stroke management state that a stroke unit must be made up of 'specially trained staff from different disciplines', that new acute treatment options require 'a higher level of clinical expertise' and that the stroke unit should have 'a permanent staff of senior consultants working specifically in the field of stroke' (2). However, there are no national standards for what 'clinical expertise' should encompass or how this expertise should be acquired. There are also no national requirements in relation to what diagnostics, treatment and monitoring should be carried out. The individual hospitals are free to define what treatment is provided for patients in their stroke units. Norway has a total of 46 stroke units, 7 of which are stroke centres that also perform intraarterial thrombectomy. These 46 units vary in terms of size, staff numbers and expertise, and are not subject to any overarching national requirements.

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In 2017, the WHO International Statistical Classification of Diseases and Related Health Problems (ICD) reclassified stroke as a neurological disease (ICD-11), as opposed to a vascular disease (ICD-10) (23, 24). This represents a challenge for the field of neurology.

Vascular neurology as a sub-specialisation was established in the United States as early as 2003 (25–27). Specialisation in stroke medicine has been introduced in several European countries (28), and the European Stroke Organisation (ESO) has been offering a master's degree in stroke medicine for a number of years (29).

The competence requirements in vascular neurology in Norway are, by comparison, very limited: a single course covering cerebrovascular circulation, 50 ultrasound examinations of the carotid arteries, 10 thrombolysis treatments and otherwise 'good knowledge of' most areas (30). Stroke patients need something more than this from neurologists.

In order to meet the need for a specialised service provision, most neurology departments have established a separate stroke section with a stroke unit and vascular outpatient clinic. Neurovascular laboratories are in the process of being developed. Oslo University Hospital and Akershus University Hospital have understood that vascular neurology requires different knowledge than that of general neurology, and have consequently established dedicated stroke teams.

Vascular neurology differs from general neurology, and in practice is a separate field of emergency medicine. From a clinical perspective, it would be advisable to introduce formal qualifications and a defined framework for education in vascular neurology.

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