

EXPENSIVE MISTAKES IN STROKE THROMBOLYSIS

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Introduction: Stroke is the third most common cause of death in the western world and probably the most common cause of chronic disability, overshadowing all other neurological disorders put together. There was no effective treatment before the advent of acute stroke units facilitating immediate rehabilitation to prevent acute and long term complications, later in conjunction with accurate brain imaging and the use of drugs and procedures which remove the obstructing thrombus. In spite of these dramatic advances, patients with acute ischaemic stroke often remain undiagnosed and untreated in the critical first hour when their disorder may be completely reversible. Failure to recognize and urgently treat these patients may have major medico-legal repercussions since thrombolysis is potentially effective in at least 50% of these patients even though it is only administered in about 5%.

In the UK medico legal litigation has increased by over 60% in the last four years, from >5000 cases in 2006 to >8000 cases by 2010, and even more in the US where the population appears to be more aware of medical negligence. US health care costs rose from 4.6% of GDP in 1950 to a staggering 17% in 2009. The difference between failure to diagnose or to realize the importance of diagnosis is costly, representing the difference between the patient returning to work the next week compare to death or life long disability.

Impact of public awareness: "Hyperacute" management of acute ischaemic stroke has now become a major factor in stroke care, creating new concepts of management with specialized stroke physicians, special brain imaging procedures, special urgent stroke care facilities and thrombolytic drugs such as tPA which may completely reverse the devastation of ischaemic stroke.

The lay public has become educated by the media to not only recognize the diagnosis of acute stroke but also in many cases, where diagnosis is made rapidly, that the problem can be completely reversed by appropriate urgent treatment. They are disappointed and resentful when their efforts are frustrated by bad clinical management and their loved one dies or is left permanently disabled. Sometimes the relatives are ahead of the Emergency Room staff in their diagnosis and insistence on immediate investigation and treatment of a possible stroke. So where are the most of these mistakes made?

Mistakes in clinical diagnosis: All transient neurological deficits are not transient ischaemic attacks (TIAs) and correct clinical diagnosis, as in any neurological disorder, is the first critical step. Complicated migraine, post ictal paralysis, psychological disorders, hypoglycaemic episodes and even unrecognized subarachnoid hemorrhage must be excluded. Accurate and immediate diagnosis must be fast since "Time is brain" and every minute counts.

Mistakes in brain imaging: The ideal CT or MRI scan prior to thrombolysis is a normal one in a patient with an acute neurological deficit, but with the risk that the patient may be receiving a dangerous drug with the wrong diagnosis if the problem is not ischaemic stroke. Most acute stroke unit physicians have made this error, fortunately rarely with adverse effects.

In the UK most imaging is by CT scan partly for financial reasons. In North American MR imaging is frequently preferred, since it allows fine tuning by comparing Diffusion to Perfusion Weighted Imaging (DWI/PWI mismatch) and shows diagnostic changes sooner (<3hrs). Microhemorrhages are imaged more clearly (using gradient echo imaging) and may precede major cerebral hemorrhage if thrombolysis is given. It may also show areas of cerebral amyloid arteriopathy which are also potential bleeding points.

However, CT scanning has the advantage of rapid access to the patient to administer the intravenous thrombolytic in the scanner and can be combined with

CT angiography and perfusion studies to image exactly the site and type of arterial occlusion.

Mistakes in hyperacute stroke care:

1) Delay the clinical diagnosis

The educated lay public are now becoming familiar with stroke diagnosis and may call an ambulance urgently but when the patient arrives at the hospital physician indecision may make thrombolysis too late. Some countries have special ambulances equipped with doctors and even scanners on board en route to hospital so the patient arrives with both clinical and imaging confirmation.

2) Delay the brain imaging

Once clinical diagnosis is confirmed urgently on hospital arrival CT scanning has the advantage of both rapid confirmations with immediate thrombolysis with the patient still in the scanner, unlike MR scanning where the patient must be removed for intravenous injection. The sooner thrombolysis is started the more effective the drug

Effectiveness of thrombolysis: As more data accumulates the original disappointing therapeutic effects documented in early trial have been superseded, and several recent tPA trials have achieved figures of 44% patients with Rankin values (R) = 1-2 and 23% achieving values as low as R = 0-1. The initial skepticism and anxiety of mechanical clot retrieval using devices inserted angiographically to remove the clot using a "cork screw" maneuver has been overcome, and also has the advantage of being applicable to proximal arterial clots which usually respond poorly or not at all to IV tPA.

Conclusion: Hyperacute stroke therapy is still evolving, with newer thrombolytics and more emphasis on mechanical clot removal, possibly shifting the emphasis more to neuroradiological than neurological mistakes.