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Research Article

THROMBOLYSIS IN WAKE-UP ACUTE ISCHEMIC STROKE

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ABSTRACT

Wake-up acute ischemic stroke is medical emergencies as in reality there is a narrow window for acute reperfusion therapy with iv thrombolysis in this group.
There is a significant amount of patients who presents with wake-up acute ischemic stroke reaching around 30%.
If no appropriate diagnostic tools are used clinician is likely to miss opportunities for IV thrombolysis leading to increased morbidity leading to acute stroke patients.
Among the available imaging techniques CT brain, CT perfusion, and MR diffusion perfusion, MRI diffusion, and FLAIR (fluid-attenuated inversion recovery) mismatch techniques can be used to determine and quantify viable tissue (penumbra) in this wake-up stroke group.
In this article, we review the current recommendations and best available imaging techniques and how they can be used in the identification of penumbra for acute reperfusion therapies in acute ischemic stroke which has presentation as wake-up stroke.

INTRODUCTION

Acute Ischemic stroke is emergency and treatment is acute reperfusion therapy eighter IV thrombolysis or mechanical thrombectomy. Acute reperfusion therapy are often offered to acute ischaemic stroke if patient present in window period that's 4.5hours for iv thrombolysis. So, iv thrombolysis are often offered to patient as long as exact time of onsetis understood.

There is group of patients who presents aswake up stroke, patient will be completely normal when he attends sleep but wakes up with neurodeficits due to stroke. Treatment of wake-up stroke is challenging as exact time of onset is not known and neurologist faces dilemma in providing acute reperfusion therapy. Incidence of wake up stroke variable from 8% to 39% in severalstroke-registry–based studies, but typically in between 15% and 25% (1,2,3).

Mechanism of wake up stroke

It is known that sympathetic tone, vascular reactivity, blood pressure variable with biological time, these parameters importantto take care of cardiovascular health (4). Variation of those parameters in circadian events contributes to cardiovascular dysfunction including stroke (5). Stroke features a propensity toprecipitate at a specific time-of-day; presumably to occur during the hours of 6:00 a.m. and 12:00 p.m.(6,7,8,9).

Primary evidence of this early morning susceptibility has been linked to a spread of things that are activated or inhibited during this point, many of which possess a robust circadian component.

Probable cause for variation and risk of vascular events variations in circadian rhythm activity is platelet aggregability, cortisol and catecholamines levels in serum (6,8,9 10,11). These factors contribute to hypercoagulable state during the first morning hours, causing more adversevascular events including stroke. Other factors liable for hypercoagulable state are plasma cortisol, plasma renin activity, angiotensin II, aldosterone, arterial stiffness, vascular resistance, blood viscosity, (6) also this factors associated with inflammation-induced plaque rupture in atherosclerotic lesions, greatercommon carotid artery artery intima-media thickness values, workout, spirit (anger) and sexual activity" (9).

Anyone of the above-mentioned factors or a mixture of some might trigger an ischemic event leading to a stroke (6,8,9). There are make risk factors for stroke but variation in blood pressure has very strong correlation to stroke incidence. Management of this (early morning) blood pressure variation can reduce stroke incidence. (8,9,12). Blood pressure features avery strong circadian component. Studies claimed that night-time blood pressure that predicts the risk towards a stroke (11,13).

A arrangement proposed by Karmarkar and Tischkau inregard to Circadian rhythmicity and neuronal excitotoxicity for determining the population at highest risk for stroke. this technique is predicated on the "dipping status" (vital sign drop) of a private. Thesesystem classified subjects as "dippers" (blood pressure dropped at night), "non-dippers"

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(bloodpressure didn't drop at night) and "inverted dippers" or "risers" (blood pressure was increased at night).

These study demonstrated that the "non-dippers" and "risers" were related to higher risk of ischemic vascular events like stroke .so Control of blood pressure at night would produce a far better outcome than that obtained by controlling the first morning surge was one among conclusion (24).

How tothrombolyse patient where time of stroke onset is unknown?

For a example we will be discussing a real life case for which thrombolysis was done.

A 58 years diabetic and hypertensive male came with H/o difficulty in holding and operating call phone at 7.30am when he got up and mild difficulty in waking (there was no exact time of onset available)There was no associated facial deviation, dysarthria Patient was Conscious with pulse were 88/min with blood pressure of 140/80 mmHg. His higher mental function was normal and normal cranial nerves with Right pronator drift with weakness of hand grip lower strength was 3/5 related to decreased sensation over involved limb (distally) her NIHSS score was 5.

Her MRI brain with angiogram was showing left Left MCA left MCA territory infarcts (left frontal, parietal, lobe infracts) with M2 -MCA narrowing implicational intracranial disease Large artery (image 1) Disease (TOAST-I). His MRI FLAIR imaging was normal in sight of presence of intracranial disease, he was thrombolysised with iv (70 mg) r-tPA as per NINDS guidelines. His cardiac workout including ECG and a couple of DECHO was normal, TEE (grade II atheroma in arch and descending aorta). later 1-week ELR was negative for fibrillation. His blood workout revealed normal sr. homocysteine, lipids, Patient was started on dual antiplatelets, statins after 24 hours after repeat CT scan.

Wake-up stroke not very uncommon, affecting around 20% of patients with stroke and Adding cases with unknown time of symptom onset for, not witnessed, stroke with aphasia or disturbance of consciousness, additionally contributing. In 30% of patients with acute stroke time of symptom onset is unknown.

Imaging Concepts to for Reperfusion therapy for Wake-Up Stroke

1. Non contrast CT
2. Perfusion–Diffusion MRI mismatch
3. DWI –FLAIR Mismatch
4. CT Brain Perfusion

Imaging Concepts to Guide Reperfusion

Treatment in Wake-Up Strokeon basis of Non contrast CT. Exclusion of intracranial haemorrhage, Exclusion of huge early ischemic signs involving quite one third of the territory of the Middle cerebral artery by noncontract CT (14) there two exclusive exclusion criteria should be followed for taking decision for thrombolysis on basis of non-contrast CT in case of wake up stroke if no advanced imaging facility is available.

Perfusion–Diffusion MRI mismatch

This is one of best MRI technique to access penumbra (Tissue at risk)

MRI DWI and MRI - perfusion imaging, allows for the characterization of tissue indanger for infarction by the mismatch between irreversibly damaged tissue depicted by DWI and critically hypo perfused while still viable brain tissue captured by perfusion imaging. MRI Perfusion –diffusion mismatch ratio of >1.2 is suggested to define a penumbral pattern, while large infarct core(eg, DWI lesion >70 mL) is excluded. (16,17,18)

MRI DWI -FLAIR mismatch

Estimation of Stroke Lesion Age by DWI–FLAIR Mismatch The mismatch between a clear acute ischemic lesion on DWI and therefore the absence of marked parenchymal hyperintensity on FLAIR images (DWI–FLAIR mismatch) has been demonstrated to spot patients likely to be within 4.5 hours of stroke onset. (15, 23) Recent study MR WITNESS shown Intravenous thrombolysis within 4.5 hours of symptom discovery in patients with unwitnessed stroke with MRI DWI and FLAIR mismatch (where MRI DWI is abnormal - restriction but MRI flair is normal) (15,16,17,1821)

This imaging of MRI brain with angiogram (Image1) in acute ischaemic stroke which incorporates imaging sequences Diffusion weighted images and FLAIR and intracranial TOFF is ideal example. Imaging shows MRI DWI AND PWI matches with DWI–FLAIR Mismatch for assessment of penumbra.

CT Brain Perfusion

CT ismore widely available. Perfusion CT parameters want to define the ischemic core and therefore the surrounding viable hypo perfused tissue(Pneumbra).

Infarct core is typically defined by threshold relative cerebralblood flow values, for instance, 145% or CT-T max >6 second comparable the perfusion MRI (19,20).

CONCLUSION

Basic principle of imaging techniques in awaken acute ischaemic stroke is to spotpenumbra -tissue in danger where timely reperfusion of this tissue prevents conversion of penumbrato infract (dead tissue) So in era of acute stroke treatment evolved tons and awaken stroke contributes to significant bulk of patients. With advanced imaging techniques like MRI DWI -PWImismatch and MRI FLAIR mismatch and CT perfusion it became possible to increase advantage of revascularisation with thrombolysis to awaken stroke group of patients.

In prevention of wake up stroke in appropriate management of early morning blood pressure (peak) will be beneficial.

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