published in Reader's Digest,
22 June 2023

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Globally every two seconds someone has a stroke. Being a potentially treatable ‘brain attack’, when the brain is deprived of blood because a blood vessel has burst or is blocked, stroke requires rapid diagnosis, transfer to hospital and treatment. One size doesn’t fit all in stroke medicine: doctors need to tailor the treatment according to what has happened inside the brain, and when.

Stroke or something else?

Many conditions mimic stroke; misdiagnosis is common. Up to 40% of patients admitted to hospital with suspected stroke have an alternative diagnosis [5], including migraine, seizure, vertigo, multiple sclerosis, or a brain tumour.

Sometimes, symptoms of a previous stroke can return, when the survivor suffers an illness like pneumonia or a bladder infection – but there’s no new brain injury requiring treatment. “It’s as if the stress of the new problem causes the brain to forget what it learned to compensate for the disabilities of the old stroke,” writes neurologist and stroke researcher Dr John Marler, in his book “Stroke for Dummies”.

Red or white?

Dr Marler classifies stroke into two categories. So-called ‘red strokes’ are caused when a blood vessel bursts inside the brain or, rarely, just outside, in something known as a subarachnoid haemorrhage - leaking blood, and turning the brain from pink to red. These are a less common type of stroke, but often more serious.

‘White strokes’ account for 85% of all strokes, and involve a blood clot blocking an artery, cutting off blood supply. Brain tissue, deprived of blood, dies and turns from pink to white. Treatment is very different for red or white stroke.

Passing or permanent?

Whether it's facial droop, arm weakness, speech problems, or something else such as headache or dizziness– if symptoms clear within a matter of minutes or within 24 hours, you may have had what is known as a 'mini-stroke' or transient ischaemic attack [6]. Take it seriously, for your next stroke may not be transient: nearly 1 in 5 people who have had a TIA go on to have a stroke within 90 days. Repeated TIAs, meanwhile, may lead to dementia, as damage accumulates in the brain.

Treatment after TIA involves a combination of lifestyle changes, medication (especially aspirin) and, in some cases, surgical removal [7] of the fatty deposits in your carotid arteries, which are the main vessels bringing blood to the brain.

Big or small?

Blood clots and brain arteries come in different sizes – and stroke's impact on the brain can be more catastrophic when a major artery is affected. Doctors survey the severity of your symptoms (before scanning the brain) to work out which arteries might be affected, and so which need treatment.

Sometimes though, there's back-up blood flow from a different part of the brain, through branches of other arteries, and the origin of your stroke is less obvious in your symptoms. Other times, a patient can present with severe disability when only a small artery has blocked or burst, but in a very critical part of the brain.

Clot buster or corkscrew?

Or vacuum cleaner! These are all ways (at the microscopic level) to treat strokes caused by clots. Clot buster drugs dissolve the clot, and restore brain blood flow; tiny devices inserted into brain arteries (having entered the body through a blood vessel in the groin and been pushed upwards) can suck the clot out, or corkscrew into it and pull it loose. Recovery can be dramatic, with paralysed limbs sometimes starting to move as the clot is suctioned out.

Delving deep into arteries to clear clots has been proven to work in trials including the landmark (and brilliantly-named) MR CLEAN [8] study. Its results received a standing ovation at the World Stroke Congress in Istanbul in 2014.

Awake or asleep?

The trouble with clot buster drugs is that they need giving within the first few hours of the stroke striking. As time passes, the stroke has done its damage and the risk of the drug causing a bleed (a known side-effect) then exceeds the benefit of busting the clot. The Oxford Handbook of Stroke Medicine states that, when using these drugs, "the onset of stroke must be known, or must be deducible, to be definitely within 4.5 hours".

But one in five strokes happen during sleep. Upon waking, there is no way to know when the stroke happened. Clot-busting drugs cannot be given, unless sleep lasted less than 4.5 hours. Aspirin is likely to be prescribed instead.

Blood pressure – how low to go?

Treating red strokes is of course very different to treating strokes caused by clots. Giving clot-busting drugs after brain haemorrhage would worsen the bleed, and could be catastrophic.

Reducing blood pressure, through medication, to slow the flow of blood from the ruptured artery (like turning down the tap to a leaky hose) may seem like a good idea, and trials named CHIPPS [9] and INTERACT [10] support this. But going too low with blood pressure risks reducing blood flow to the brain, worsening the damage. A "watch and wait" approach [11] is recommended by doctors, unless blood pressure is very high on admission.

Clips or coils?

When there's a bleed on the surface of the brain, its origin is often a weak spot resembling a "burst balloon" in the

wall of an artery, known as an aneurysm. Repairing this, to stem the flow and prevent further bleeds, is no mean feat.

Metal clips, resembling tiny ice tongs, can close off the neck of the aneurysm (rather like tying a knot at the base of a balloon). Getting there though requires an opening being made in the skull.

An alternative is to go through the groin (as with the vacuum cleaners and corkscrews), and instead send hair-width pieces of platinum up through blood vessels, twisting and turning until they reach the brain. These spring into coils within the aneurysm [12], blocking blood flow and bleeding.

Treating the cause or consequence?

After medical treatment for your burst or blocked artery, an entire team of health care professionals will be assigned to treat the consequences of your stroke, in a programme of stroke rehabilitation [13]. Up to 70% of stroke survivors have altered speech, whether slurred, slowed (in word production or understanding), or soft. Speech and language therapists can help, paying attention also to possible swallowing problems, which can raise your risk of choking.

Help is also at hand to treat post-stroke pain, fatigue, muscle tightness or weakness, incontinence, pressure sores, and possible visual problems. Recovery can continue for months and years after stroke.

Mind or body?

The psychological impact of stroke can be as noticeable as the physical. Emotions such as laughing or crying can be hard to control, in a recognised post-stroke condition known as emotionalism; anxiety, frustration, anger and depression are also common. The Stroke Association [14] assures survivors that things do get better - with time, talking therapies, taking it easy on yourself, and medication.

Celebrate the small successes in your recovery – or the really big ones. Composer George Frideric Handel wrote his most renowned work, Messiah [15], after a stroke at the age of 52, whilst living with deep depression.

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