



Carotid stenosis management: time to address the misconceptions ('furphies')

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Improper management of carotid artery disease for stroke prevention is prevalent. Accumulating misconceptions ('furphies') drive the overuse of carotid artery procedures and the inappropriate use of medicines. Recognition of these furphies is essential to improve disease management and optimize patient outcomes.

According to Wikipedia, a 'furphy' is Australian slang for an erroneous or improbable story that is claimed to be factual. Furphies are supposedly heard from reputable sources, sometimes secondhand or thirdhand, and are widely believed until discounted. Furphies abound in the use of carotid artery procedures and medicines for stroke prevention. These misconceptions, often published in journals with high impact factors, are taking a huge toll on patient welfare and health economies worldwide.

The risk of stroke associated with advanced asymptomatic carotid stenosis ($\geq 50\%$ narrowing) has decreased significantly over the past 3–4 decades with medical intervention alone (lifestyle coaching and medication)¹. The latest reported average annual rate of ipsilateral stroke is 0.8% with medical intervention alone, which is 2–3 times lower than with carotid surgery (endarterectomy) or carotid stenting in previous randomized trials¹. Even better outcomes are expected with current optimal medical intervention¹. These findings indicate that we have passed the era in which a carotid procedure is likely to provide an overall benefit in this patient population¹. Furthermore, these findings have implications for improved prevention for all who are at risk of atherosclerotic arterial disease, including 'symptomatic' patients with stroke or transient ischaemic attack¹.

Furphies about carotid procedures

That markers exist to select individuals with asymptomatic carotid stenosis who are now likely to benefit from a carotid procedure. Proposed markers include embolic signal detection, plaque echolucency and the most severe categories of stenosis². These proposed markers are generally too common individually to be selective and, as a group, cover nearly all patients with asymptomatic carotid stenosis. Furthermore, when measured, most of these markers are associated with a low rate of ipsilateral stroke without a carotid procedure. None has been evaluated in the context of current optimal medical intervention or in randomized trials. Populations

with advanced asymptomatic carotid stenosis who are now likely to benefit from a carotid procedure are rare (perhaps non-existent given the inherent procedural risk) and remain unidentified¹.

That the results of randomized trials are replicable in routine practice. Carotid procedural outcomes are often (perhaps usually) worse in routine practice than in randomized trials¹. For example, it took many years before the average 30-day peri-operative rate of stroke and death in registries of endarterectomy in patients with asymptomatic carotid stenosis matched those of the Asymptomatic Carotid Atherosclerosis Study (published in 1995 and still the most relevant randomized trial)¹. Meanwhile, the standards for the 30-day peri-operative rate of stroke and death from carotid procedures in asymptomatic or symptomatic patients derived from past randomized trials have become increasingly outdated and excessive since trial publication owing to continuing advances in medical intervention¹.

That guidelines reliably portray the scientific evidence. In many ways, prevailing clinical guidelines encourage the use of carotid endarterectomy well beyond the subgroups of asymptomatic or symptomatic patients shown in trials to benefit from carotid endarterectomy compared with medical intervention alone³. Meanwhile, carotid stenting is also widely recommended despite never having been compared with medical intervention and being more dangerous than carotid endarterectomy^{1,4}.

That the outcomes from carotid endarterectomy and transfemoral or transaortic carotid stenting are similar. Several inaccuracies propagate this furphy⁵, most notably the following.

- Leaving out the peri-procedural period, which is when the excess rate of stroke and death from carotid stenting occurs⁶. The excess rate of stroke and death with carotid stenting compared with carotid endarterectomy is apparent in the peri-procedural period

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and for as long as we have followed up patients in randomized trials¹.

- Using underpowered studies to claim that the higher peri-procedural rate of myocardial infarction with carotid endarterectomy compensates for the higher peri-procedural rate of stroke with carotid stenting⁵. Carotid stenting is actually associated with a higher peri-procedural rate of stroke, death and myocardial infarction than carotid endarterectomy^{1,4}.
- Using underpowered studies to claim that the rate of the most severe strokes is similar with carotid endarterectomy and carotid stenting⁷. No trial has been adequately powered to exclude a clinically significant difference in the rate of the most severe strokes associated with different carotid procedures¹.
- Using the very high prevalence of disability from any cause in patients with carotid stenosis to statistically camouflage the excess disability caused by stroke from carotid stenting compared with carotid endarterectomy⁷.

That new procedural indications can be established without proper studies of current optimal medical intervention. For example, transcrotid artery revascularization is currently being introduced based only on comparisons with carotid endarterectomy and carotid stenting.

Furphies about stroke-prevention drugs

Scientific understanding about what constitutes the most effective and efficient use of existing medicines for stroke prevention has evolved over decades across many specialties, causing uncertainty and confusion. A few examples of furphies are described below.

That all patients with asymptomatic carotid stenosis should be treated with antiplatelet therapy. The current evidence is for no antiplatelet therapy in patients who are completely asymptomatic, which includes many with asymptomatic carotid stenosis⁸.

That patients with asymptomatic carotid stenosis should now be treated with antiplatelet therapy and low-dose anticoagulation. These individuals have not been shown to benefit from such therapy, particularly if stratified according to the presence and timing of any previous clinically manifest arterial disease complications⁹.

That all patients with atrial fibrillation (a carotid stenosis comorbidity) benefit from anticoagulation. Atrial fibrillation is a common comorbidity among patients with carotid stenosis. The risk of thromboembolism is heterogeneous according to the type of atrial fibrillation¹⁰. In keeping with the relevant randomized trials, anticoagulation should be limited to patients with recently documented atrial fibrillation (within the past 1–2 years) and recurrent or persistent atrial fibrillation. The use of anticoagulation in populations other than those shown to benefit in clinical trials is overtreatment and exposes patients to a risk of life-threatening bleeding (approximately 2–3% per year), without demonstrated benefit.

The way ahead

Current best management of patients with carotid stenosis is summarized in Supplementary Table 1, noting that evidence for an overall benefit from carotid endarterectomy for symptomatic patients was limited to highly selected subgroups, is from trials in which randomization occurred decades ago (1981–1994) and has not been re-evaluated^{1,3}. Recognizing misconceptions (furphies) is essential to optimize patient outcomes. Articles like this one help but are not nearly enough. Medicine requires novel and generally applied mechanisms to facilitate widespread understanding of how scientific evidence is derived and the nature of current best practice. Medical graduates need to be equipped with critical thinking skills, including expertise in fundamental clinical statistical analysis. Medicine needs more incentives to utilize current best practice.

In addition, more opportunities are required for research, ‘fact’ checking, and employing critically thinking, financially independent academics in clinical settings. Mechanisms are required to systematically measure key outcomes from routine clinical practice. Funding for clinical services should be better directed towards services that improve patient outcomes. Medicine requires active, ongoing de-adoption of ineffective and overall harmful treatments. Savings should flow back to enable ongoing research. These steps are essential if we are to move from the current, and economically unsustainable, ‘activity-based’ health-care model to patient-focused health care.

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Competing interests

The author declares no competing interests.

Supplementary information

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