Atrial Fibrillation: The Faulty Cement Mixer

Abstract:

For many years, atrial fibrillation (AF) was viewed as a relatively benign dysrhythmia. However, AF is now recognized as a dangerous pathology and a major cause of potentially preventable death and disability. AF is the most common cardiac arrhythmia. It affects 3% of our population, predicted to rise to 4.5% by 2045, and affects up to 25% of over 80-year-old men. AF is a leading cause of stroke and is implicated in an estimated 1 in 4 strokes internation­ally and may be a major factor in 1 in 3 strokes in Ireland4. Stroke caused by AF has a higher morbidity and mortality, results in longer hospital stay and represents a higher cost to the economy than stroke due to other etiologies. However, the majority of AF-related strokes are preventable and effective anticoagulation can reduce the risk of stroke by 65%. Furthermore, stroke outcomes are improved in patients with AF which occur while on therapeutic anticoagulation4. Extrapolating this to our national stroke rates, we could infer that up to 1600 strokes per year in Ireland are potentially preventable with anticoagulation, with a potential annual saving of €173 million in this country.

Awareness of AF among the general population is poor. From an Irish population survey, we know that only 30% of the general population have heard of AF5. Half of these people, despite having heard of it, don't know what AF is, and most are not aware that AF is a risk factor for stroke. From the TILDA study, we now know that 38% of those with AF were not aware of having the condition, and that 39% at high risk of stroke with AF were inadequately treated. We face three key problems in tackling the burden of atrial fibrillation and stroke; the high rates of undiagnosed or asymptomatic AF, a lack of public awareness of AF and its dangers, and continuing to challenge traditional barriers and beliefs in considering effective anticoagulation in AF.

The hunt for undetected AF

Screening for AF to date has been largely ignored compared with other large-scale national screening programmes. Taking a look at the Wilson-Junger criteria, AF ticks all the major boxes; it is an important health problem, detectable at an early stage, with a suitable, acceptable, low-risk test, with clear benefit from early treatment. A recent Cochrane review concluded that while both systematic and opportunistic screening increased the rate of diagnosis, opportunistic screening was more cost-effective, though further investigation is warranted. The recent STROKESTOP study has demonstrated the beneficial effect of simple screening in large scale at-risk populations.

For any screening programme to be effective, uptake is the most important factor. Cancer screening programmes in this country have demonstrated that Irish people are willing to participate and that rates of uptake in cancer screening have surpassed international target rates. Among all types of screening, the major determinants of uptake appear similar; public understanding, socio economic factors, ethnicity and gender6. Organized recruitment strategies have emerged as the most effective way to improve uptake, but public awareness of the condition and its implications is crucial for public engagement.

Tackling Public awareness

We know from the experience in both stroke and cancer campaigns that media campaigns increase public awareness of the disease and its symptoms and can result in a change in behaviour at population level. However, they have limited efficacy in the longer term if campaigns are not sustained4,7. A potential obstacle in any AF campaign is in conveying the message to a wider audience, as the concept might appear somewhat abstract; a fibrillating atrium leading to blood stasis and thrombus formation, thus causing a stroke could be a problematic explanation for public engagement, and even more so if one has never heard of the atrium and doesn't fully understand or know what a stroke is. An analogy which we find useful clinically at the bedside is that of a faulty cement mixer. Building site cement mixers are a common site and if the mixer is 'faulty', not mixing the cement adequately so that it hardens and forms large 'clots', which, if it leaves the cement mixer, will obstruct flow downstream, causing stroke.

AF: Greater understanding from research needed

On a different level the cement mixer analogy might also prove useful for clinicians, challenging us to better understand the inter-individual variability in the mixers and the cement, and what makes AF a greater risk for one individual than for another. While CHADS2 and CHA2DS2-VASC have helped clinicians better identify those with risky mixers and unhealthy cement and have led to a level of consistency between clinicians in deciding upon anticoagulation, they are still relatively blunt tools when it comes to understanding the complex pathophysiology of thrombus formation in the fibrillating atrium. Older patients with AF and apparently no other risk factors still suffer strokes, and the annual risk of stroke with a CHADS2 score of zero is still an appreciable 1.98

In addition the risk of stroke is probably not static, but changes over time and with circumstance. This is perhaps additionally dependent on the duration of the inadequate mixing, the type of mixer and the nature of the cement. We know that advancing age, diabetes, hypertension, vascular disease, heart failure and prior stroke all increase the risk, but other factors such as prothrombin, chronic kidney disease and COPD are also possibly important5. Left atrium and
appendage size, left atrial ejection velocities and the atrial endothelium may be important components of an individual's mixer and tissue injury during surgery for example or ischaemia as occurs post-operatively and in sepsis, may cause the cement to harden at an accelerated rate. However, it is unclear yet how best to predict this risk within specific patient populations.

Although our understanding of AF is ever expanding, and our risk stratification systems have become more refined, there remain complex challenges for physicians in targeting this disease. A sensitive and cost effective screening programme has yet to be explored in Ireland. Engaging the public through understandable awareness messages is crucial for the success of any screening programme that emerges. Finally, expanding our knowledge of predictors of stroke in AF, and proactively anticoagulating all those at risk who are suitable will lead to improved outcomes and a reduced burden of stroke on our society.

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References

Comments: