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RISK FACTORS FOR STROKE AND USE OF ECHOCARDIOGRAPHY IN DIAGNOSIS: A REVIEW

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ABSTRACT

Background: Stroke is a prevalent disease in many communities. Cardiologists consultation and cardiac investigations are frequently requested to rule out cardiac source of embolic manifestations. The heart has been reported to account for 20% of ischaemic strokes in the Western community.

Objective: To review risk factors for stroke and the use of echocardiography in its diagnosis.

Methods: Medline review was done for reported causes of stroke, these causes were divided into major and minor and were discussed briefly as general physician need to determine when and what to ask for.

Results: Some cardiac sources do have established roles in strokes but others have circumstantial and/or secondary roles.

Conclusion: While there exists evidence to recommend echocardiogram in stroke patients with heart disease, it is routinely needed in all patients with stroke. In some circumstances, echocardiography may enhance the diagnosis but not necessarily change management.

INTRODUCTION

Stroke is a major health problem and the socio-economic consequences of the stroke are numerous and include financial, functional, social and psychological loss. It is the third leading cause of death in the world(1).

The role of cardiologist in stroke: Stroke is a condition that should be treated with the same enthusiasm as that used in managing a patient undergoing seizures. Patients who present within three hours of an episode should be considered for fibrinolytic therapy. Several risk factors are shared between ischaemic heart disease and ischaemic stroke and these have been well documented. Stroke has become an essential and integral part of Advanced Cardiac Life Support(2).

The true prevalence of the heart as source of embolism where intracardiac masses were identified, has been shown to be 4% by transthoracic echocardiogram (TTE) and 11% by transoesophageal echocardiogram (TEE) (3). This difference is due to close vicinity of TEE probe to the heart without barriers(4).

The heart has been reported to account for about 20% of ischaemic strokes(5). Other causes are atherosclerotic cerebrovascular disease such as carotid and intracranial vascular diseases which are responsible for about 20% of cases, penetrating arterial disease (lacunar) account for 25%, cryptogenic stroke accounting for about 30% and the remaining 5% are attributed to other causes such as hypercoagulable state, vasculitis, carotid dissection and vasospasm(6-13). Consequently, the search for cardiac source of emboli is an important issue, which should be undertaken.

Major risk sources of emboli: The major risk sources of embolisation are those in which there is strong association with stroke due to their great potential for embolisation. They are regarded as minor when the association was noticed but not definite. A review of the recommended therapy based on American Heart Association/American College of Cardiology or American College of Chest Physicians with the reference to guidelines for clinical application of echocardiogram is suggested(14-16).

The major risk sources of embolisation are as follows:

Atrial fibrillation: Embolic rate reported varies according to the risk subgroup. In lone atrial fibrillation this risk is between 1-8% per year(17). Anticoagulation (AC) is recommended with INR 2-3.

Mechanical valves: Embolisation risk for mechanical aortic valve is 1.5% per year. This is doubled in mechanical mitral valve(5). The guidelines recommend AC with INR 2.5-3.5 with addition of aspirin at a dose of 81 mg /day.

Mitral stenosis: In patients with sinus rhythm and left atrial enlargement, embolic rate reported was 8-14%. This is doubled with AF patients to about 31% and further increases to 65% when there is prior history of embolism(5,18).

Intra-cardiac thrombosis: This occurs in the setting of post myocardial infarction particularly in the anterior cardiac area (19). AC with INR 2-3 as per American College of Cardiology/American Heart Association, however, American College of Chest Physician do not favour AC, but this was not in cases related to stroke

Recent myocardial infarction: Stroke rate of 1-2% occurred annually (20). AC with INR 2-3 has been shown to decrease stroke rate.

Dilated cardiomyopathy: This tends to have apical thrombi with an embolic rate of 4% per year(5). AC is controversial in this condition. However, observational data from SAVE and SOLVD STUDIES suggested beneficial effect with AC(21,22).

Aortic arch atheromatous plaques: The annual risk of emboli is 14-21%. This is influenced by plaque morphology and size. Complex plaques more than 4mm in diameter, mobile or ulcerated are more likely to embolise and had higher recurrent stroke rate (23-27). Options of treatment are AC, the use of antiplatelet therapy or surgical resection (24,25,28). Current evidence favours the use of AC with surgery being considered in highly selected cases. Although a significant decrease in stroke rate by surgical resection has been demonstrated in some reports (29,30), overall surgical approach has been associated with a high post operative stroke rate(31).

Marantic endocarditis: This is defined as a non-bacterial vegetation that is smaller in comparison with bacterial vegetation, with variable echo density, less independent motion and usually located at the base of the leaflets. They have been described in malignancy and connective tissue diseases and may embolise in 14-90% of cases(32). The diagnosis depends on the clinical settings and treatment is directed towards the cause. Heparin had been suggested as therapeutic modality(33).

Infective endocarditis: In this condition a stroke rate of 12-40% per annum has been reported(34). Appropriate use of antimicrobial chemotherapeutic agents in addition to selective surgery, has been recommended.

Atrial myxoma: Stroke may occur in up to 25% of this condition. Surgery is the treatment of choice. Papillary fibroelastoma although benign may embolise leading to stroke(35).

Minor risk sources: Patent foramen ovale (PFO)-stroke occurs in 2% per year following an initial episode of stroke when PFO is identified (23,36). There is insufficient (no) evidence to recommend for or against any specific therapy for patent foramen ovale(3). PFO is common in normal people, hence stroke patients should be managed by AC and the opening closed by a device or surgery or venous interruption if they meet certain criteria like cases of recurrent cerebrovascular event or multiple infarcts on MRI(27,37,38). Another indication for closure is; PFO in which greater than 50 microbubbles are seen in the left atrium on contrast TEE or stroke or transient ischaemic attack that are preceded immediately by valsalva manoeuvre(27). Although PFO is common, paradoxical embolisation is rare, hence concurrent diagnosis of deep vein thrombosis or pulmonary embolism is thought to justify above therapeutic modalities(6,13). The combination of PFO and atrial septal aneurysm has a substantial risk for recurrent stroke (39).

Mitral valve prolapse: Increased incidence of stroke is thought to be due to thickened, myxomatous valve, effect on left atrial size or increased incidence of atrial

fibrillation(3,23). Aspirin is suggested for transient ischaemic attack and AC with INR 2-3 for stroke cases.

Mitral annular calcification: Its role is not well defined. Some authorities recommend AC, if the embolus is not calcified(15).

Ventricular aneurysm: Stagnation of blood is a good milieu for thrombus formation. Embolic rate is less than 1% per year(40).

Interatrial septal aneurysm: This is defined as bulging in the region of fossa ovalis more than 1.5cm beyond the plane of atrial septum. The mechanism is not clear but in two thirds of the cases, patent foramen ovale was detected. Therapeutic measures are not defined yet, but antiplatelet therapy may be helpful (23,39).

Calcified aortic stenosis: A common finding in the elderly. Studies are going on to determine its role in stroke and the effect of aspirin on its prevention(41).

Valvular strands: These are filamentous fibrin material that are thin and attached to aortic or mitral valve, also known as "Lambl's excrescences." It has become a common finding in clinical practice with the use of TEE but its role in stroke is debatable(42).

Spontaneous echocontrast: This is defined as swirling contrast due to slow blood flow in left atrium, also known as "smoke sign". It has been recognised more frequently with the advent of the use of TEE. However, echocardiogram settings may influence smoke detection, especially to the gain setting of the echo machine. It is often associated with atrial fibrillation. Embolic rate is not known. No specific therapy had been recommended(43).

Modalities of investigations that can be used: Three approaches of investigations can be used. Direct TEE examinations or TTE followed by TEE, if the former is not diagnostic or selective TTE or TEE. The decision as to which approach is appropriate in an individual case is dependent on a number of factors. First, before embarking on a specific test, it is important to elucidate the effect of test result on patient's management. Therefore, the echocardiogram should lead to identify for example, a condition requiring anticoagulation in a patient that will normally not be considered for such a therapy. In contrast, patients with atrial fibrillation or mechanical heart valve will require anticoagulation for their underlying problem, irrespective of the results of the test. On the other hand, patients with atrial fibrillation will not require echocardiogram for a diagnosis, since electrocardiogram will suffice. It is to be remembered that although TEE is much more sensitive for conditions such as left atrial thrombus and aortic arch atheroma(7-9), TEE carries a 0.2% risk of adverse effects (both major and minor) with 0.01% risk of death(10). The risk of fatality following TEE is ten times the risk of endoscopic examination. However, this has to be weighed against the risk of embolisation. If the source of embolism is identified, the risk of death increases considerably to 0-38% (11,12). Cost effectiveness of TEE has been confirmed in cases with heart diseases(13).

The Canadian guidelines concluded that there is fair evidence to recommend echocardiography in patients with stroke and clinical evidence of cardiac disease by history, physical examination, electrocardiography or chest radiography. TEE is recommended as the preferred initial screening test, based on its sensitivity and cost-effectiveness.

There is insufficient evidence to recommend for or against TEE in patients with normal results of TTE. There is insufficient evidence to recommend for or against routine echocardiography in patients (including young patients) without clinical cardiac disease. In contrast, the American guidelines recommend echo routinely for those who are below the age of 45 years (16). Routine echocardiography is not recommended for patients with clinical cardiac disease who have independent indications for or contraindications to anticoagulant therapy(5).

In conclusion, while there exists substantial evidence to recommend echocardiogram in stroke patients with heart disease, it is not routinely needed. These are conditions in which echocardiogram is not needed to make a diagnosis of the cause of stroke, which in others the performing echocardiogram may enhance diagnosis but not change the management of the patient.

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