

The importance and effectiveness of Carotid Endarterectomy in Ischaemic Stroke or TIA with significant Carotid stenosis.

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### Abstract:

In advanced world stroke is one of the disabling cause of death that can be managed with thrombolysis if presents early despite further risk of intracerebral haemorrhage. Secondary prevention is an important objective in ischaemic stroke where recurrence is very high with subsequent stroke. Carotid End Arterectomy impact a definitive and effective role for both symptomatic and asymptomatic carotid stenosis for secondary stroke prevention in selective cases. Thrombolysis is a potential primary management for certain group whereas carotid surgery employs secondary preventative measure in a specified ischaemic stroke group.

### Keywords:

Cerebral autosomal dominant arteriopathy with subcortical infarcts and leuco encephalopathy (CADASIL); Carotid Endarterectomy (CEA); Modified Rankin Scale (MRS); Computed Tomography(CT); Tissue plasminogen activator (tPA); Diffusion weighted Imaging (DWI); Recognition of Stroke in the Emergency Room (ROSIER) scale; Magnetic resonance Imaging (MRI); Internal Carotid Artery (ICA)

### Introduction

Stroke cause long term disability which is the third most common reason of death in modern world. Despite first time stroke results in death around 15%-35% which could increase to 65 % following stroke within a year [1]. Multiple factors are associated behind the pathogenesis of stroke while mutation of Notch 3 gene is involved with familial subcortical stroke, Cerebral autosomal dominant arteriopathy with subcortical infarcts and leucoencephalopathy (CADASIL), comprising diverse phenotypic genetic contour [2]. Most collective etiology of ischaemic stroke that sources occlusion is cerebrovascular and embolic in origin which accounts around 85% of all stroke [3]. Studies reveal greater benefits from carotid endarterectomy in a patient who has moderate to severe symptomatic (70%-90%) stenosis compare to mild to moderate symptomatic (50%-69%) narrowing preventing subsequent stroke [4]. In routine clinical practice thrombolytic therapy is supported for ischaemic stroke by evidence based all stroke studies including ECASS I, ECASS II and SITS-MOST due to significant

reduction of mortality and morbidity [5]. In stroke prevention, The CEA plays a strategic role in both symptomatic and asymptomatic patient with gaining significant clinical and anatomical outcome [6].

### **Thrombolysis for Ischaemic stroke**

Thrombolysis with IV tissue plasminogen activator ( tPA ) is the treatment of choice if patient present within 4.5 hours window period from stroke symptoms recommended by all stroke studies[7]. High blood pressure is challenging for thrombolysis which should be managed with intravenous antihypertensives. Stroke assessment and initial ROSIER scale advocates suitability for thrombolysis and CT brain scan excludes haemorrhage. MRI brain with DWI is more sensitive for early diagnosis of infarction rather than conventional CT brain scan even though few studies found normal MRI DWI brain in a symptomatic patient who underwent thrombolysis [8]. Randomised control trials and meta analysis proposed treatment with IV Tissue plasminogen activator ( tPA ) would be beneficial to complete recovery 1 in 10 patient, 1 in 14 cases would be risk of symptomatic intracerebral haemorrhage but 1in 100 patient could die from this thrombolysis if presented within 3 hours of window period [9]. Acute hospital with hyperacute treatment set up systematise patient attendance within thrombolysis window period and initiate thrombolysis safety checklist documents to exclude any contraindication for thrombolysis. Canadian study suggested, thrombolysis with IV Tissue plasminogen activator( tPA) in ischaemic stroke patient who are elderly (over 80 years) did not find any increase significant risk of intracerebral haemorrhage compare to below eighty years older patient [10]. Carotid Endarterectomy is advantageous with symptomatic carotid stenosis after exclusion of risk criteria. Radiological evaluation of internal carotid artery significant stenosis supports operative possibilities along with clinician and vascular team's evaluation. Medical team and vascular surgeon evaluate patient's symptoms, comorbidities and imaging studies to find appropriate candidate who will be benefitted from carotid Endarterectomy to prevent further stroke. Therefore, carotid Endarterectomy operation should be justified, beneficial and effective comparing risk and benefits for long term secondary stroke prevention. Despite the perioperative risk, carotid end arterectomy for symptomatic carotid stenosis significantly reduce the subsequent stroke [11]. Greater outcome from carotid surgery is recognised when operation is performed within two weeks of ischaemic stroke or transient Ischaemic attack while delay in surgery minimise benefits [12]. Ballotta et al, established in recent studies that unstable plaque with lower graded symptomatic stenosis is helped efficiently as well as safely from carotid endarterectomy surgery [13]. Therefore, symptomatic carotid artery stenosis is a clear indication for carotid surgery patient having ischaemic stroke and TIA.

### **Secondary prevention of stroke with recommendation for carotid endarterectomy for Internal carotid artery stenosis (ICA).**

Carotid endarterectomy is effective for symptomatic 70-99% carotid stenosis but carotid endarterectomy is not recommended for the symptomatic patient with less than 50% radiographic stenosis [16]. Carotid endarterectomy can be recommended for 50-69% symptomatic carotid stenosis if benefits outweigh the risk of this procedure. Long term specific benefits is minimal for near radiographic carotid stenosis but evidence showed benefits nearly two years. Multiple studies demonstrated greater benefits and recommended carotid end arterectomy with two weeks of onset of TIA or stroke symptoms . Aspirin should be continued for both symptomatic and asymptomatic patient waiting for Carotid endarterectomy operation with a view to continue at least at least three

months post operatively. However, different studies did not appreciate sufficient data to suggest other antiplatelet post procedure[15].

<b>ICA Stenosis</b>	<b>Recommendation for CEA</b>
<50% stenosis ( Symptomatic)	Medical management
50-69% stenosis ( Symptomatic)	Can be recommended CEA
70-99% stenosis ( Symptomatic)	Recommendation for CEA
60-99% stenosis (Asymptomatic)	Can be recommended CEA

### **Consideration of risk benefits rationale for decision of Carotid Endarterectomy**

Clinician should consider the comorbidities and geographic importance prior to recommend carotid endarterectomy with symptomatic 50-69% stenosis. Both NASCET and ECST studies does not include those patient who present with ipsilateral carotid involvement with impaired normal function. Studies suggested Perioperative stroke or death rate should be less than <6% for < 50 % symptomatic carotid stenosis because in this patient group best medical management is preferable[15]. It is recommended to acknowledge at least five years patient life expectancy prior advising operative procedure. Furthermore, CE can be suggested for patient with 40-75 years who has asymptomatic 60-99% carotid stenosis based on life expectancy at least five years. Multi trial studies does not suggest emergent carotid endarterectomy despite progressive deficit of neurological symptoms. In addition, Carotid endarterectomy deliver more benefits for Stroke or TIA involving hemisphere rather than involving retinal vessel such as retinal infarction and amaurosis fugax.[14] Radiological evidence of contralateral arterial occlusion causes more surgical risk. Perioperative complication and risk of recurrent stroke, Myocardial infarction and death should be considered however multicentre research analysis noted similar complication following Carotid endarterectomy alone compare with simultaneous coronary artery bypass graft operation [15].

### **Conclusion**

Carotid Endarterectomy significantly reduce mortality and morbidity through preventing subsequent stroke. Risk and benefits form carotid surgery should be addressed appropriately to achieve maximum benefits through timely, effective and rationalised patient assessment. In symptomatic carotid stenosis, operative preference overweigh the benefits of stroke prevention than the risk of operative vulnerabilities when patient is scrutinised in addition to justify the rationale consequence.

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