The current strategic management of asymptomatic carotid stenosis

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Abstract

Asymptomatic carotid stenosis has been enormously debated, especially in the aspect of ischemic neurological prevention. The better efficacy of antiplatelets and lipid lowering agents may be enough for prevention of stroke. Patient with high risk plaque have the greater risk of stroke than usual. The characters of high risk plaque such as rapidly progressive stenosis, larger plaque area, large lipid core, thin fibrous cap and the evidence of distal embolization should be elucidated in all patient with carotid stenosis

Carotid endarterectomy (CEA) or carotid stenting (CAS) are currently suitable treatment in asymptomatic carotid stenosis of >60-70%. Although, the CEA had the lower risk of perioperative complications, but the higher risk of postoperative myocardial infarction. Therefore, the CAS may be alternative treatment especially in the patient who had high risk of perioperative complication from CEA.

Despite of the many issues concerned for strategic planning of stroke prevention. Comprehensive discussion between physician and patient are also the crucial complementary strategy for stroke prevention therapy.

Keywords: Asymptomatic carotid stenosis, Carotid endarterectomy, Carotid stent, Unstable plaque, High risks plaque (J Thai Stroke Soc. 2024;23(1): 22-28)

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Introduction

Carotid stenosis is immensely recognized as a important risk of ischemic stroke especially in symptomatic carotid stenosis. Symptomatic carotid stenosis is usually defined by accompanying with ipsilateral stroke or TIA within 6 months. It is well known as a major risk of recurrent ischemic stroke and the strategy for secondary stroke prevention is obviously declared.

But not in asymptomatic carotid stenosis, the lower risk of ipsilateral ischemic vascular event compared with symptomatic carotid stenosis and multiple interference factors unable to standardize the suitable strategy for stroke prevention. Neurological ischemic vascular prevention such as medical therapy and carotid intervention are wildly concerned. The better efficacy of antiplatelet and lipid lowering agent, the cost effectiveness of interventional and surgical management are currently debated.

This review will intensely focus on different remedies and strategic management to prevent ischemic vascular event in asymptomatic carotid stenosis.

What is asymptomatic carotid stenosis?

Asymptomatic carotid stenosis is defined by the carotid stenosis without any ipsilateral neurological or ophthalmological ischemic event. Patient with these symptoms of longer than 6 months is also included. Severity of carotid stenosis is very crucial to determine strategy. Two major measurement of severity of stenosis such as the NASCET and ECST method (Figure 1) are universally applied, but most of clinical trials were usually regard the NASCET method as a method of choice.

How much risk of stroke in asymptomatic carotid stenosis?

There are multiple risk factors providing potential to ischemic stroke or TIA. Severity of carotid stenosis is one of the most mentioned. The higher degree of carotid stenosis provided the greater risk of ipsilateral ischemic stroke and TIA (especially >70% stenosis regarding to ECST method and >50% stenosis according to NASCET method)[1, 2]. Patient with asymptomatic carotid stenosis of >70% (NASCET), the overall risk of ipsilateral vascular event was around 11–12% during 5 years of follow up[2]. risk of ipsilateral ischemic vascular event also directly related to annual progression of stenosis. Patient with annual stenotic progression of >20% (eg, <50% to >70% or <70% up to >90%) had 4–7 times greater risk of ipsilateral ischemic vascular event compared with the lesser stenotic progression[3, 4].

Beside the severity of stenosis, others factors such as plaque area, translucent plaque type, evidence of distal embolization were also high risk characters of concern. Around 35% of patient who had carotid plaque area of >80 mm^2 may present with ipsilateral ischemic stroke within 5–6 years[4]. Evidence of hyperintensity signal (HITs) from 2 hours transcranial Doppler monitoring (TCD–monitoring) indicated to the higher risk of ipsilateral ischemic vascular event (14% at tow year of follow up)[5]. If we combined translucent type plaque together with evidence of distal embolization, the risk of ischemic stroke will be aproximately 21–22% at the first year[6].

Many clinical trials immensely reinforce us to pay more attention on others character of unstable plaque. Thin fibrous cap, large lipid core and intraplaque hemorrhage were others important risky characters (Figure 2). Large lipid core increased risk of stroke around 3–7 times

while the intraplaque hemorrhage increased risk of stroke up to 3–10 times[7].

From the prior clinical studies, we infer to keep focus on determination of characters of high risk plaque or unstable plaque in every patient with asymptomatic stenosis. Beside the characters of plaque, the detection of annually progressive stenosis and the distal embolization are still the immense factors should be concerned and considered.

How to manage the patient with asymptomatic carotid stenosis?

The most effective strategy for secondary stroke prevention in asymptomatic carotid stenosis is identification of patient who has high risk of ipsilateral ischemic vascular event. The intensive medication including antiplatelets and lipid lowering agent, carotid endarterectomy (CEA) and carotid stenting (CAS) were universally accepted as the effective treatments for stroke prevention (Figure 3).

According to AMECT study in 2015[8], patient with asymptomatic carotid stenosis of >70% had benefit from CEA with 5 times lower risk of stroke compared with intensive medical therapy. But on the other side of hand, risk of perioperative stroke was quite higher in patient with CEA[9, 10]. Despite of the better benefit of CEA the high risk patient who will be suffer from the complications of CEA should be determined. Contralateral carotid occlusion, history of class 3–4 heart failure, class 3–4 unstable angina, recent MI within 30 days and COPD should be initially screened and excluded from CEA because of the higher risk of post operative MI. Therefore, the risk of perioperative complication of <3% (ipsilateral stroke/TIA, any stroke/TIA with 30 days after operation or death) is universally acceptable[8, 9, 10].

CAS is the other interesting therapeutic intervention proven from many clinical studies to be as effective as CEA for stroke prevention in symptomatic carotid stenosis, but with the higher acceptable risk of operation related complication of around 6%. According to ACST-2 trial, the long term risk of procedural death or any stroke in asymptomatic carotid stenosis who had been performed CAS was significantly higher than CEA, especially in perioperative period (within 30 days)[11]. The same as symptomatic carotid stenosis, CEA in asymptomatic carotid stenosis had significantly greater incidence of postoperative MI than CAS[10, 11].

What should be the suitable strategy for stroke prevention in asymptomatic carotid stenosis?

From the initial knowledges and aforementioned clinical studies, there are many points should be considered to achieve the suitable strategy for stroke prevention in asymptomatic carotid stenosis. The first one, identification of patient with the higher risk of stroke such as carotid stenosis of >60%, annually progressive stenosis (>20%), hypoechoic plaque, plaque with ulceration, large lipid core, intraplaque hemorrhage and evidence of distal embolization should be elucidated. We have to keep focus on the intensive treatment during the first 1–3 years of initial diagnosis[6, 12], because of the greater risk of stroke. Beside the characters at risk of plaque, the ipsilateral cerebral infarction lesion from CT brain was also the other important maker of the higher risk of ipsilateral stroke or TIA in the future, which may predict the risk up to 5 years[13] of follow up.

The second is to determine the proper medical therapy or carotid intervention for stroke prevention. Some atherosclerotic studies proved the efficacy of high potency statin therapy

(atorvastatin 40 mg, rosuvastatin 40 mg) for reduction of subclinical atherosclerosis. The target of LDL control should achieve to 50% reduction of LDL over 1–2 years and maintained the level of LDL of around 70–75 mg/dl[15, 16]. But not for antiplatelet therapy, there was insufficient evidence and clinical trial proved the benefit of antiplatelet medication for stroke prevention in moderate to severe asymptomatic carotid stenosis. Despite insufficient evidence, aspirin 81–325 mg may be given as a reasonable therapeutic choice of treatment[17].

CEA is usually better than CAS in the aspect of lesser perioperative stroke complication but higher risk of post operative MI. The characters at risk of post operative MI such as class 3–4 of HF, class 3–4 of unstable angina, MI within 30 days and COPD should be determined and have to be considered and prefer CAS to CEA (Table 1)[18]. The contralateral carotid occlusion is the other important risk of post operative stroke after CEA. Therefore, the CAS should be the considered as a first priority the rapeutic strategy[14]. The following table (Table 1) summarized the high risk factors for CEA and CAS which should be considered as the rapeutic decision making tool for treatments interventional and surgical in asymptomatic carotid stenosis[18].

Finally, interventional and surgical considerations in asymptomatic carotid stenosis of >60–70% should be accompanied with the control of perioperative complication rate of <3%[10]. Others related multiple factors including suitable anatomy of aorta, carotid arteries, and personal medical conditions should be together concerned in therapeutic decision[18].

In case of asymptomatic carotid stenosis of <60%, the therapeutic strategy decision may be more difficult. The elucidation of high risk characters of plaque will reinforce us to administer intensive antiplatelet and lipid lowering therapy as the primary therapeutic strategy. However, medication failure may be possible. Carotid interventions either CEA or CAS may be reasonably considered as individual investigational treament. Even the different therapeutic strategies based on the insufficient clinical trial, the deep discussion of risk, benefit and the statistic clinical data with patient will be the crucial issue to achieve the suitable and proper strategy. Figure 4 demonstrates strategic decision and management in asymptomatic carotid stenosis.

Conclusion

The asymptomatic carotid stenosis of >60% should be surgically or interventionally treated with acceptable risk of perioperative complication of <3%. The all kinds of high risk characters should be elucidated before therapeutic decision. Aggressive medical therapy, a very crucial part of treatment should be performed in either symptomatic or asymptomatic carotid stenosis, especially together with regular surveillance of severity of carotid stenosis.

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Figure 1. *Demonstrate the two major method of measurement of anatomical stenosis (N-method and E-method) and the relative comparison of degree of stenosis*[10]

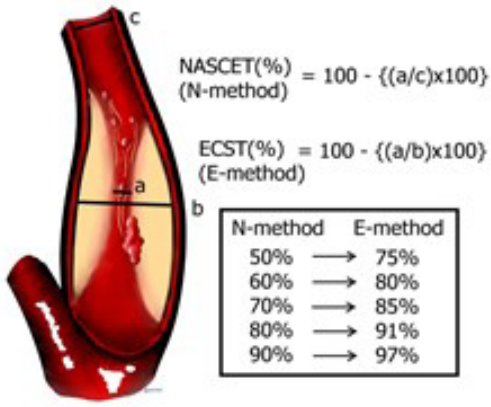
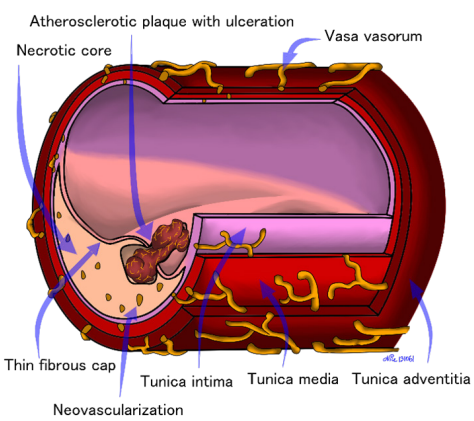
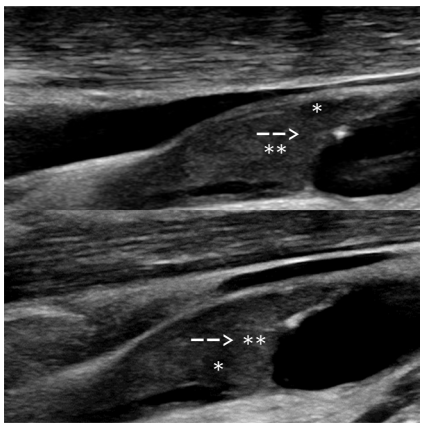


Figure 2. *a). The illustration demonstrate the anatomy of high risk plaque features. b). Ultrasonography of ruptured thin fibrous cap (arrow) with intraplaque hemorrhage (*) and thrombotic propagation (**) leading to proximal ICA stenosis/occlusion.*





a) b)

Figure 3. *a). Illustration of procedure of carotid endarterectomy (a.1) and carotid stenting (a.2). The digital subtraction angiogram of carotid stenosis (*) and carotid stent (**) insertion as a treatment of carotid stenosis.*

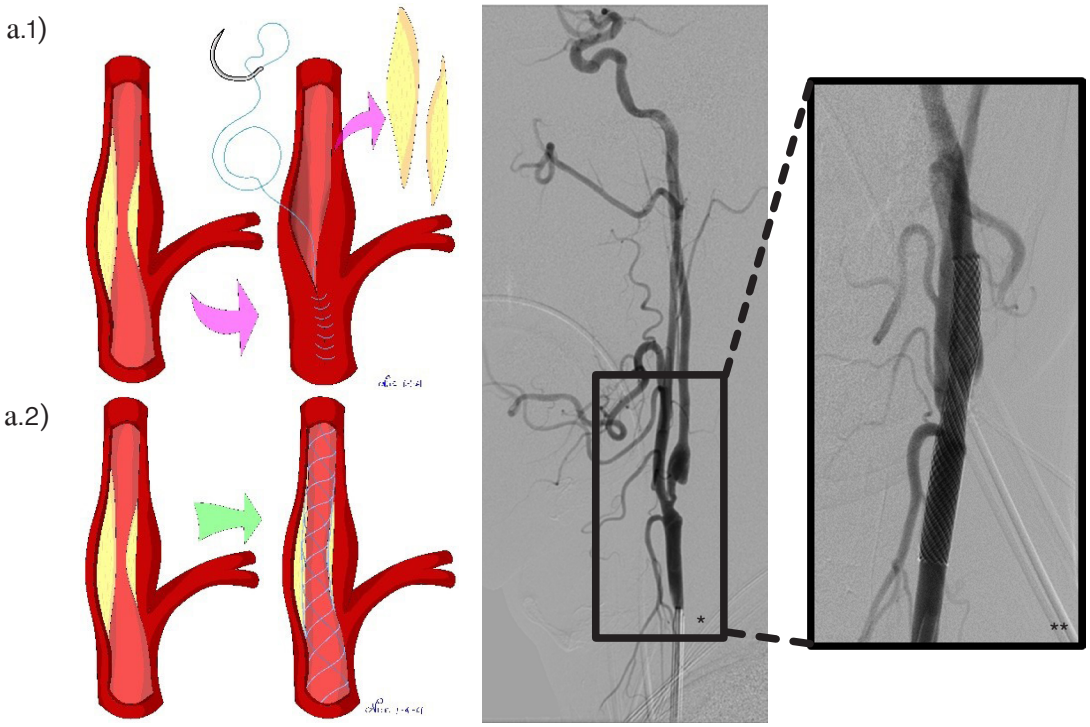


Figure 4. *Strategy of management of asymptomatic carotid stenosis. * the perioperative risk on each institute should be measured as statistically analysis (ipsilateral stroke/TIA, any perioperative stroke/ TIA, death).*

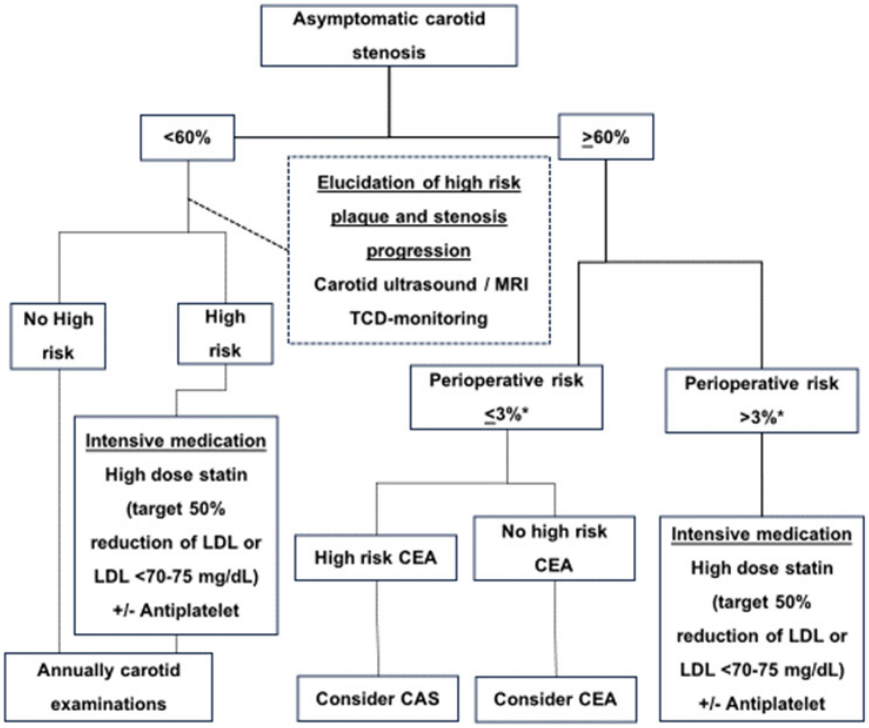


Table 1. *High risk conditions for CEA and CAS*[15]

Parameters	Non-vascular	Vascular	Medical conditions
High risk for CEA	- Lesion above C2	- Contralateral carotid occlusion - Severe tandem lesion	- Age >75-80 years - CHF NYHA functional class 3-4 - LVEF <30-35% - Two coronary disease with >70% stenosis - Unstable angina - MI within 30 days - Abnormal stress test - Planed open heart surgery within 30 days - Uncontrolled diabetes
High risk of CAS		- Tortuous vessel - Heavy atherosclerosis of aorta, type 3 or tortuous aorta, severe aortic stenosis - Heavy calcification of carotid artery - Complex or circumferential bifurcation stenosis >15 mm length - Lesion-related thrombus	- Age >70-80 years - Chronic renal insufficiency or severe renal disease - Decreased cerebral reserve - Dementia