

WHAT IS THE BEST THERAPY FOR SYMPTOMATIC INTRACRANIAL ARTERY STENOSIS? ENDOVASCULAR TREATMENT (STENTING)

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Introduction: The incidence of ischemic stroke in various European countries is between 183-349 /100 000 and in the Czech Republic 219/100 000. 30%–50% of stroke survivors do not regain functional independence and 15%–30% of all stroke survivors are permanently disabled. The occlusion or severe stenosis of cervical or intracranial arteries is the most common cause of acute ischemic stroke. Intracranial Stenosis causes 8-10 % of ischemic strokes in Caucasian population, the frequency only slightly less than that of carotid stenosis. It is the most common cause of stroke in Asians, in whom it is estimated to cause 30-60% of strokes. The probability of stroke, vascular death and brain hemorrhage was 22 % in the WASID study. Prevalence of asymptomatic intracranial stenosis is common in patients with vascular risk factors. It occurs in 7-23% of patients with vascular risk factors. The question is if (besides the best medical treatment) the intracranial stenting could improve the nature course of patients with symptomatic intracranial stenosis.

Diagnosis and follow-up of intracranial stenosis: Moderate agreement was found between CT angiography and digital subtraction angiography in the evaluation of intracranial stenosis. Transcranial color-coded sonography is noninvasive, cheap and safe diagnostic method useful for screening of patients in whom atherosclerotic risk factors are present. The criteria for diagnosis of intracranial cerebral artery stenosis are based on peak systolic velocity measurement in the stenotic site.

Magnetic resonance angiography (MRA) has high sensitivity and specificity in detecting all categories of stenosis degree and occlusion. However, it tends to overestimate lesions.

Although conventional digital intraarterial subtraction angiography is currently considered to be the gold standard in extracranial artery stenosis, in the diagnosis of intracranial stenosis its position is not so dominant. CTA (MRA) or TCCS are useful for screening and a follow-up.

DSA confirms diagnosis during the procedures.

Pathophysiology: Stroke mechanism: There are five main mechanisms of stroke arising in the case of intracranial stenosis.

1. Artery to artery (distal) embolism – thrombus or plaque material subsequently embolizes to distal branch of artery.
2. Artery to artery (proximal) embolism – embolus from proximal (extracranial stenosis) may embolize to distal intracranial large vessel stenosis.
3. Hemodynamic – reduction of a blood flow in the territory of a stenotic vessel, particularly during periods of hypotension.
4. Local branch vessel compromise – perforator stroke – atherosclerotic plaque may occlude the ostia of small perforators
5. In situ thrombosis – plaque rupture or thrombus formation results in complete occlusion.

Risk factors for recurrent stroke: The results of previous studies show that the highest risks for stroke or TIA are as follows:

1. Severe 70-99 % intracranial stenosis
2. Previous stroke in the territory of stenotic artery
3. The time from stroke (The first year after stroke, or the first two months)
4. Hemodynamic symptoms of stroke.

Endovascular Treatment: Several trials were done using stents for intracranial vascular stenosis. In SSYLVA trial - prospective, multicentre, single arm study with balloon expandable stenting system -

61 patients were enrolled. The overall 1- year risk was 13.1% and more than 50% of restenosis were present in 32% stents and they were symptomatic in 39% of patients.

There are one trial and two registries with a Wingspan Stent system.

Technical success was achieved in 98 % of procedures, the mean stenosis decreased from 75 % to 32 % , a 30-day risk of stroke was about 4.5 % to 9.6 % and 50% and more restenosis rate was in 34 % in which 32% were symptomatic.

Groschel et al have done a meta analysis of 31 studies and 1177 stenting procedures. He proved that a median periprocedural risk of stroke or death was about 7. % and at a mean follow-up time of 13.5 months, the cumulative probability of stroke or death was 12%.

Patient selection for stenting: Selection criteria are not clear due to the absence of randomized trials. In my opinion they are as follows: 1. Symptomatic patients with stroke or TIA (probably recurrent) in the territory of stenotic artery modified Rankin scale less or equal to 2 points. 2. 70-99% of stenosis of intracranial artery with the target area of stenosis up to 14 mm in length , diameter of intracranial artery of 2.00 mm to 4.50 mm. 3. Stenosis without collaterals and with hemodynamic mechanism of stroke arising (borderzone infarction demonstrated on MRI imaging) 4. Short time from TIA or Stroke (up to 1 month)

Conclusion: The major stenting registries suggest that angioplasty and stenting of intracranial athero-sclerotic lesions are technically feasible in about 95% of patients.

Nevertheless, periprocedural complication (stroke) and symptomatic restenosis rates were unacceptably high in previous studies. Currently, intracranial stenting is still an investigational technique which should be performed in experienced Comprehensive Stroke Centers and a strict selection of patients with the highest risk of recurrent stroke in the territory of stenotic artery is crucial for reaching the highest benefit of stenting. Randomized clinical trials—including the ongoing trials SAMPPRIS and VISSIT—are needed to clarify the role of stenting in the treatment of intracranial atherosclerotic disease.