Carotid artery stenting (CAS)

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Common carotid artery stenting is a medical procedure performed to treat carotid artery stenosis, which is the narrowing of the carotid arteries that supply blood to the brain. It is a less invasive alternative to carotid endarterectomy, a surgical procedure used for the same purpose.

During common carotid artery stenting, a thin, flexible tube called a catheter is inserted into an artery, usually in the groin, and guided up to the site of the carotid artery stenosis. Using X-ray guidance, the catheter is advanced to the affected area. Once in position, a small, expandable mesh tube called a stent is placed at the site of the stenosis. The stent is then expanded, pushing against the walls of the artery, and helps to keep the artery open.

The stent acts as a scaffold, improving blood flow through the carotid artery and reducing the risk of stroke. Some stents are designed with a filter or a protective device to capture any debris that may break loose during the procedure, preventing it from reaching the brain.

Common carotid artery stenting is typically performed under local anesthesia, meaning the patient is awake but the area being treated is numbed. It is often considered for patients who are at high risk for complications from carotid endarterectomy, such as those with previous neck surgery, radiation therapy, or significant medical comorbidities.

Like any medical procedure, common carotid artery stenting carries some risks, including the potential for blood vessel injury, stroke, infection, or allergic reactions to contrast dye used during the procedure. However, it is generally considered safe and effective when performed by experienced medical professionals.

Indications

Carotid artery stenting is indicated for the treatment of carotid artery stenosis, which is the narrowing of the carotid arteries that supply blood to the brain. The procedure may be recommended in certain situations, depending on the severity of the stenosis and the patient's overall health. The main indications for carotid artery stenting include:

Symptomatic Carotid Artery Stenosis: Carotid artery stenting is commonly recommended for patients who have experienced symptoms related to carotid artery stenosis, such as a transient ischemic attack (TIA) or a minor stroke. These symptoms may include temporary vision loss, weakness or numbness on one side of the body, difficulty speaking, or dizziness. In such cases, carotid artery stenting aims to reduce the risk of future stroke by improving blood flow through the carotid arteries.

Asymptomatic Carotid Artery Stenosis: Carotid artery stenting may also be considered in certain cases of asymptomatic carotid artery stenosis, particularly when the stenosis is severe (greater than 70% narrowing). The decision to proceed with stenting in asymptomatic cases is often based on factors such as the patient's age, overall health, life expectancy, and the presence of other risk factors for stroke.

High-Risk Candidates for Carotid Endarterectomy (CEA): Carotid artery stenting is sometimes recommended for patients who are at high risk for complications from carotid endarterectomy, which is a surgical procedure used to treat carotid artery stenosis. High-risk factors may include previous neck surgery, radiation therapy to the neck, severe heart or lung disease, or advanced age. Carotid artery stenting is considered a less invasive alternative for these patients.

It is important to note that the decision to undergo carotid artery stenting should be made on an individual basis, taking into consideration the patient's specific medical condition, overall health, and the expertise of the healthcare team. A thorough evaluation by a vascular specialist or a neurologist is typically conducted to determine the most appropriate treatment approach for each patient.

Carotid artery angioplasty and stenting (CAS) has experienced an astonishing rate of development, becoming a viable alternative to carotid endarterectomy (CEA) in the management of carotid artery stenosis. Many trials have attempted to compare both treatment modalities and establish indications for each, depending on clinical and anatomic features.

Eller et al. review the historical evolution of carotid stenting; its main technical aspects, indications, and contraindications; as well as the most important clinical trials comparing CAS and CEA [1)].

Primary carotid stenting, performed using self-expanding stents alone without deliberate use of embolic protection devices and balloon angioplasty, has been shown to be effective and faster, cheaper, and potentially safer than conventional techniques.

see also Bilateral carotid artery stenting.

Carotid artery stenting (CAS) is a neuroendovascular treatment where a stent is deployed within the lumen of the carotid artery to prevent a stroke by treating carotid artery stenosis.

It has emerged as an alternative to carotid endarterectomy. In randomised trials comparing stenting with endarterectomy for symptomatic carotid artery stenosis, stenting was associated with a higher risk of procedure-related stroke, particularly in elderly patients, but with lower risks of myocardial infarction, cranial nerve palsy, and access site haematoma [2) 3) 4) 5)].

A systematic review showed that the increase in procedure-related risk was driven by non-disabling stroke, with no evidence for a difference in rates of major or disabling stroke or death between the treatments [6)].

Complications

see Carotid artery stenting complications.

Efficacy

see International Carotid Stenting Study.

Residual stenosis after carotid artery stenting

A study investigated the effect of residual stenosis after carotid artery stenting (CAS) on periprocedural and long-term outcomes.

Patients treated with CAS for symptomatic or asymptomatic carotid arterial stenosis were consecutively enrolled. Residual stenosis was estimated from post-procedure angiography findings. The effects of residual stenosis on 30-day periprocedural outcome and times to restenosis and clinical outcome were analyzed using logistic regression models and Wei-Lin-Weissfeld models, respectively.

A total of 412 patients (age, 64.7 ± 17.0 years; male, 82.0%) were enrolled. The median baseline stenosis was 80% (interquartile range [IQR], 70-90%), which improved to 10% (0-30%) for residual stenosis. Residual stenosis was significantly associated with periprocedural outcome (adjusted odds ratio, 0.983; 95% confidence interval [CI], 0.965-0.999, P = 0.01) after adjustment for baseline stenosis, age, hypertension, symptomaticity, and statin use. Over the 5-year observation period, residual stenosis did not increase the global hazard for restenosis and clinical outcome (adjusted hazard ratio, 1.011; 95% CI, 0.997-1.025. In the event-specific model, residual stenosis increased the hazard for restenosis (adjusted hazard ratio, 1.041; 1.012-1.072) but not for clinical outcome (adjusted hazard ratio, 1.011; 0.997-1.025).

Residual stenosis after carotid artery stenting may be useful to predict periprocedural outcome and restenosis [7)].

Case series

see Carotid artery stenting case series.

Case reports

Endovascular revascularization of a stenotic lesion requires appropriate stent positioning. In particular, stenting of the common carotid artery (CCA) ostium makes it difficult to avoid proptosis into the aorta. Furthermore, the guiding catheter may become unstable during the stenting because of its position under the aortic arch. To resolve these problems, Terakado et al. performed antegrade stenting for a patient with a symptomatic stenotic left CCA ostium that was treated by lifting a balloon-guiding catheter with a gooseneck snare. A patient was a 74-year-old man who presented to the hospital with main complaints of right hemiparesis and motor aphasia. A left cerebral infarction due to severe stenotic left CCA ostium was diagnosed. A CT perfusion study showed decreased cerebral blood flow in the left hemisphere. Stenting of the stenotic left CCA ostium was performed using an antegrade approach. A balloon-guiding catheter positioned under the aortic arch was inflated and lifted from the right brachiocephalic artery using a gooseneck snare. The guiding catheter was stabilized during stenting. This method is highly effective for stenting CCA ostium [8)]

A 68-year-old man was admitted. Neurological examination revealed severe left-sided motor weakness. Magnetic resonance imaging showed no cerebral infarction, but magnetic resonance angiography revealed complete occlusion of the right internal carotid artery. Systemic intravenous injection of recombinant tissue plasminogen activator was performed within 4h after the onset. But, magnetic resonance angiography still revealed complete occlusion. Revascularization of the right cervical internal carotid artery was performed via endovascular surgery. The occluded artery was successfully recanalized using the Penumbra System® and stent placement at the origin of the internal carotid artery. Immediately after surgery, dual antiplatelet therapy (aspirin and clopidogrel) was initiated, and then cilostazol was added on the following day. Carotid ultrasonography and three-dimensional computed tomographic angiography at 14days revealed no further obstruction to flow.

When trying to perform emergency carotid artery stenting within 24h after intravenous recombinant tissue plasminogen activator administration, several issues require attention, such as the decisions regarding the type of stent and embolic protection device, the selection of antiplatelet therapy and the methods of preventing hyperperfusion syndrome.

Emergency carotid artery stenting for the acute internal carotid artery occlusion may be considered a safe procedure in preventing early stroke recurrence in selected patients [9)].

References

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