Carotid artery angioplasty

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.

Complications

see Hemodynamic depression.

Case series

2017

A retrospective data set of patients (n=76) who underwent CAS from 2007 to 2014 was used as input (training cohort) to a back-propagation ANN using TensorFlow platform. PHD was defined when systolic blood pressure was less than 90mmHg or heart rate was less 50 beats/min that lasted for more than one hour. The resulting ANN was prospectively tested in 33 patients (test cohort) and compared with MLR or SVM models according to accuracy and receiver operating characteristics (ROC) curve analysis.

No significant difference in baseline characteristics between the training cohort and the test cohort was observed. PHD was observed in 21 (27.6%) patients in the training cohort and 10 (30.3%) patients in the test cohort. In the training cohort, the accuracy of ANN for the prediction of PHD was 98.7% and the area under the ROC curve (AUROC) was 0.961. In the test cohort, the number of correctly classified instances was 32 (97.0%) using the ANN model. In contrast, the accuracy rate of MLR or SVM model was both 75.8%. ANN (AUROC: 0.950; 95% CI [confidence interval]: 0.813-0.996) showed superior predictive performance compared to MLR model (AUROC: 0.796; 95% CI: 0.620-0.915, p<0.001) or SVM model (AUROC: 0.885; 95% CI: 0.725-0.969, p<0.001).

The ANN model seems to have more powerful prediction capabilities than MLR or SVM model for persistent hemodynamic depression after CAS. External validation with a large cohort is needed to confirm our results 2).

2015

One hundred eighty-one patients were treated over an 11-year period. Preprocedural CT angiography (CTA) was performed in 102 of these. A morphological scale (the Predicting Long-term outcome with

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Angioplasty of the Carotid artery [PLAC] Scale), with grades from 0 to 4 and A or B, was used to evaluate the circumferential degree of plaque calcification, and the presence or absence of soft plaque. All patients were followed using duplex carotid ultrasound and plain radiographs. Satisfactory morphological outcome was defined as a peak systolic velocity < 120 cm/s and internal carotid artery/common carotid artery ratio < 1.4.

The average follow-up duration was 29.7 months (median 24.5 months, range 0.3-87 months). Univariate logistic regression demonstrated that a low calcification grade (p < 0.001), less thick calcification (p < 0.001), and moderate amounts of soft plaque (p < 0.001) are factors that are highly associated with good long-term outcome. Multivariate analyses confirmed that these factors are independent of each other in predicting outcome.

The long-term morphological outcome of primary carotid stenting was predicted with considerable accuracy by using a straightforward CTA carotid plaque grading scale.

2014

319 patients (220 asymptomatic and 99 symptomatic) who underwent carotid angioplasty from 2002 until 2012 for carotid restenosis (CR) that occurred after eversion endarterectomy. During this period, 7993 eversion endarterectomies were done for significant carotid artery stenosis. Significant CR was detected by ultrasound examination and confirmed by digital subtraction angiography or multidetector computed tomography angiography. After angioplasty (with or without stenting), color duplex ultrasound imaging was done after 1 month, 6 months, 1 year, and annually thereafter. End points encompassed myocardial infarction, stroke, and cardiovascular death (fatal myocardial infarction, fatal cardiac failure, fatal stroke), and also puncture site hematoma and recurrent restenosis. Primary end points were analyzed as early results (≤30 days after the procedure), and secondary end points were long-term results (>30 days). Variables and risk factors influencing the early-term and long-term results were also analyzed. Median follow-up was 49.8 ± 22.8 months (range, 17-121 months).

All but one procedure ended with a technical success (99.7%). In the early postoperative period, transient ischemic attack occurred in 2.8% of the patients and stroke in 1.6%, followed by one lethal outcome (0.3%). Stent thrombosis occurred in one patient (0.3%) several hours after the angioplasty, followed by urgent surgery and graft interposition. In the long-term follow-up, there were no transient ischemic attacks or strokes, non-neurologic mortality was 3.13%, and the recurrent restenosis rate was 4.4%. The rate of non-neurologic outcomes during the follow-up was significantly higher in asymptomatic patients than in symptomatic patients (4.54% vs 0%; P = .034). The statically highest rate of transient ischemic attack was verified in patients in whom Precise (Cordis Corporation, New Brunswick, NJ) stents was used (12.2%) and a Spider Fx (Covidien, Dublin, Ireland) cerebral protection device (12.5%) was used. Female gender, coronary artery disease, plaque calcifications, and smoking history were associated with an adverse outcome after angioplasty.

Carotid artery stenting is safe and reliable procedure for CR after eversion endarterectomy treatment, with low rate of postprocedural complications. Type of stent and cerebral embolic protection device may influence the rate of postprocedural neurologic ischemic events.


2)
