

Letters

Direct Catheter-Based Thrombectomy for Acute Ischemic Stroke

Outcomes of Consecutive Patients Treated in Interventional Cardiology Centers in Close Cooperation With Neurologists



We sought to evaluate the outcomes of acute stroke patients, who did not undergo thrombolysis, and who were treated by direct catheter-based thrombectomy (CBT) in 3 interventional cardiology centers without pre-existing onsite programs for neurovascular interventions. Neurologists routinely selected patients for intervention. Their selection was on the basis of clinical presentation and computed tomography (CT) imaging. The decision not to use thrombolysis was on the basis of the presence of a contraindication or on a predicted short CT-to-sheath insertion time.

We analyzed the data of 84 consecutive patients with acute ischemic stroke (National Institutes of Health Stroke Score [NIHSS] ≥ 6) who were treated in these 3 centers with mechanical thrombectomy without bridging or intra-arterial use of fibrinolytics between January 2012 and November 2014. The local ethical committees of the participating institutions approved the study.

Good neurological outcome was defined as a modified Rankin scale (mRS) ≤ 2 after 3 months. Symptomatic intracranial hemorrhage was defined as intracranial bleeding on CT or magnetic resonance (MR) imaging with neurological deterioration of ≥ 4 NIHSS grades within 7 days. Time points were defined as follows: stroke onset as the time the patient was last seen well; CT (MR) as time of initiation of CT (MR) imaging; arterial puncture as time of sheath insertion; and recanalization as time of first-documented Thrombolysis In Cerebral Infarction [TICI] $\geq 2a$ flow in the respective artery. Baseline clinical characteristics of the patients are listed in [Table 1](#).

The middle cerebral artery (MCA) was occluded alone in 46 patients; a combined internal carotid artery (ICA) lesion and MCA occlusion was found in 27 patients. The ICA was occluded alone in 9 patients, the vertebral artery was occluded in 1 patient, and the

basilar artery was occluded in 1 patient. We used the following stent retriever types: Solitaire (Covidien ev3) 41 times; Trevo (Stryker Neurovascular) 27 times; Catch (Balt Extrusion) 6 times; Penumbra (Penumbra) 4 times; BONnet (Phenox) 3 times; Eric (Terumo) 2 times; and pREset (Phenox) 2 times. Simultaneous carotid stenting was performed in 12 patients: Xact stent (Abbott Vascular) 8 times, Wallstent (Boston Scientific) 3 times, Adapt stent (Boston Scientific) 1 time. The median time intervals are shown in [Table 1](#).

Angiographic success, which was defined as TICI $\geq 2a$ flow at the end of the procedure, was achieved in 74% of patients. Immediate neurological improvement occurred in 25 patients (30%), and 6 reached complete neurological recovery (mRS = 0). Twenty-four patients (29%) were discharged directly home (no institutional rehabilitation). Good neurological outcome was achieved in 42% (35 of 84) of patients. The strongest predictor of good outcome was the time from stroke onset to an arterial puncture of <180 min; patients treated within 3 h from stroke onset had a good outcome in 54%, whereas patients treated after 3 h had a good outcome in only 31% ($p = 0.031$).

Recently, 3 randomized trials ([1-3](#)) demonstrated the benefits of timely mechanical intervention in acute stroke. Future guidelines certainly will reflect these data.

The main observations of this analysis are: 1) acute stroke interventions performed by interventional cardiologists may achieve results comparable to those of neurointerventional centers (e.g., compared with data in the MR CLEAN (Multicenter Randomized CLinical trial of Endovascular treatment for Acute ischemic stroke in the Netherlands) investigation ([1](#)); and 2) direct CBT performed without thrombolytics quickly after CT imaging may be a viable alternative to bridging thrombolysis (facilitated CBT) ([1,2](#)). Cardiology centers are able to achieve short CT to catheter laboratory times, due to their experience with primary angioplasty services for acute myocardial infarction. The first 5 cases of acute stroke treatment by interventional cardiologists were published in 2008 ([4](#)).

It is not certain whether available neuroradiology services will be able to meet the expanding needs of the population (facing the fact, that CBT becomes

TABLE 1 Baseline Characteristics, Time Delays, and Outcomes

Baseline clinical characteristics	
Female	37 (44)
Anterior stroke	82 (97)
Age, yrs	64.8 ± 13.8
Diabetes mellitus	25 (30)
History of hypertension	63 (75)
Clinical evidence of atherosclerosis	37 (44)
Atrial fibrillation (any type, any time)	34 (40)
History of stroke or TIA	9 (11)
Admission NIHSS	18.0 ± 4.1 (median 18, range 6-27)
Time delays: median values, min (IQR: 25-75)	
Stroke onset to CT	90 (55-145)
CT to sheath insertion	64 (24-89)
Sheath insertion to recanalization	53 (41-70)
Stroke onset to sheath insertion	165 (95-260)
Stroke onset to recanalization	236 (202-342)
Procedural data	
Intubation/general anesthesia use	24 (29)
Heparin dose, units	3,570 ± 3,800 (median 2500)
Angiographic and clinical outcomes	
Recanalization rate (TICI 2a/2b/3 flow)	62 (74)
Good neurological outcome at 90 days (mRS ≤2)	35 (42)
90-day mRS among early presenters (stroke onset to sheath insertion time <3 h)	3.15 ± 2.20 (median 2)*
90-day mRS among late presenters (stroke onset to sheath insertion time >3 h)	3.81 ± 2.11 (median 4)*
90-day mortality	27 (32)
Symptomatic intracranial hemorrhage at 7 days (%)	12 (14)

Values are n (%) or mean ± SD, unless otherwise noted. *p = 0.160.

CT = computed tomography; IQR = interquartile range; mRS = modified Rankin scale; NIHSS = National Institutes of Health Stroke Score; TIA = transient ischemic attack; TICI = Thrombolysis In Cerebral Infarction.

class IA indication). In contrast, interventional cardiology services for acute myocardial infarction are available on a 24/7 basis in almost all European and North American countries, and are becoming more available on other continents. Thus, in places where neuroradiology services are not available, the involvement of interventional cardiologists may be a reasonable option.

Direct mechanical thrombectomy performed by a cardiologist may be considered a treatment option for acute stroke in centers where no neurointerventional services exist. Cardiology centers are able to achieve short CT to catheter laboratory times due to their experience in primary angioplasty for acute myocardial infarction. Outcomes are comparable to endovascular interventions performed in neuroradiology centers.

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Net Clinical Benefit for Oral Anticoagulation, Aspirin, or No Therapy in Nonvalvular Atrial Fibrillation Patients With 1 Additional Risk Factor of the CHA₂DS₂-VASc Score (Beyond Sex)



Whether to anticoagulate patients with atrial fibrillation (AF) and 1 stroke risk factor (i.e., CHA₂DS₂-VASc [congestive heart failure, hypertension, age