## ON-LINE APPENDIX

### *Endovascular Procedure and Postintervention Medications*

In all patients, an 8F or 9F balloon-tipped guide catheter (Concentric Medical, Mountain View, California) was positioned in the common carotid artery. If the proximal cervical lesion could be crossed without problems, a distal occlusion treatment was performed first (distal occlusion first strategy). The proximal lesion was crossed with a 0.014-inch guidewire mounted on a 1.7F microcatheter (Headway; MicroVention, Tustin, California), followed by an intermediate catheter, either a 5F Sofia MicroVention or a 5MAX catheter (Penumbra, Alameda, California). All catheters were continuously flushed with nonheparinized saline solution. The intermediate catheter was placed downstream of the proximal occlusion, as close as possible to the thrombus. For intracranial thrombectomy, the target occluded vessel was crossed with the 0.014-inch guidewire and the 1.7F microcatheter. After withdrawal of the guidewire, a stent retriever was deployed using the unsheathing technique to entirely cover the clot. The Solitaire FR (Covidien, Irvine, California), Trevo/Trevo ProVue (Stryker, Kalamazoo, Michigan), Revive SE (Codman Neurovascular, Raynham, Massachusetts), or Catch system (Balt, Montmorency, France) was used. Contrast medium was injected through the intermediate catheter to evaluate the flow after stent placement (eg, the bypass effect). After 3–5 minutes, the stent retriever was withdrawn under aspiration through the intermediate catheter, either manually with a 50-mL syringe or by using the Penumbra aspiration system (Penumbra). After complete removal of the stent retriever, the content of the intermediate catheter was aspirated or the catheter was completely removed if the aspiration did not work, to prevent the reinjection of aspirated clot fragments.

As soon as a reperfusion TICI score of 2b/3 was achieved, a 300-cm microwire (Transend 0.014-inch guidewire; Stryker) was introduced through the intermediate catheter, which was then immediately removed. The microwire was placed in the cervical ICA downstream of the proximal lesion. The circle of Willis functionality was assessed by opacification of the other supra-aortic trunks by puncture of the contralateral common femoral artery. In the case of ineffective circle of Willis supply to the recanalized middle cerebral artery, a stent was placed across the proximal occlusion or the stenotic arterial segment (Carotid Wallstent, Boston Scientific, Natick, Massachusetts; Precise stent, Cordis, Fremont, California; Casper stent, MicroVention; or Xact, Abbott Vascular, Abbott Park, Illinois).

Stent deployment and balloon angioplasty were performed under flow arrest with the balloon-guide catheter. The stent was inserted on a case-by-case basis. In case of highly stenotic lesions that could not be broken through with the intermediate catheter, a proximal occlusion treatment was performed first (proximal occlusion first strategy). The proximal lesion was crossed by using a 0.014-inch guidewire and primarily treated by carotid angioplasty and stent placement. Angioplasty was performed before or after stent placement, according to the stenosis severity and the possibility of deploying the stent first. Then, intracranial thrombectomy was performed as described above. In all patients, no protection device was used and the femoral artery puncture sites were closed with an 8F Angio-Seal (St. Jude Medical, Minnetonka, Minnesota) after the intervention.

**On-line Table 1: Baseline demographic features, procedural data, and clinical outcome**

| | ATO Group ($n$ = 66) No. (%) or (Mean) | DTO Group ($n$ = 20) No.[a] (%) or (Mean) | IICO Group ($n$ = 201) No. (%) or (Mean) | $P$ Value |
|---|---|---|---|---|
| Age (yr) | 66 (67 ± 10) | 20 (52 ± 10) | 201 (66 ± 15) | <.001 |
| Men | 49 (74.2) | 14 (70) | 91 (45.3) | <.001 |
| Hypertension | 33 (50) | 6 (30) | 114 (57) | .05 |
| Cigarette smoking | 39 (59.1) | 5 (25) | 54 (26.9) | <.001 |
| Dyslipidemia | 25 (37.9) | 4 (20) | 66 (32.8) | .33 |
| Diabetes | 11 (16.7) | 1 (5) | 27 (13.4) | .41 |
| Left side | 40 (60.6) | 14 (73.7) | 88 (45.4) | .01 |
| Distal occlusion | | | | |
| ICA termination | 30 (45.5) | 0 (0) | 45 (22.4) | <.001 |
| MCA | 36 (55.5) | 20 (100) | 156 (77.6) | <.001 |
| Baseline NIHSS score | 66 (17 ± 6) | 19 (18 ± 4) | 201 (18 ± 5) | 1 |
| Baseline DWI–ASPECTS | 65 (7 ± 2) | 19 (7 ± 1) | 193 (7 ± 2) | .51 |
| IV rtPA | 40 (60.6) | 15 (75) | 138 (68.7) | .36 |
| Onset-reperfusion time (min) | 57 (386 ± 160) | 16 (313 ± 93) | 157 (332 ± 112) | .07 |
| Procedural time (min) | 59 (82 ± 44) | 13 (81 ± 34) | 126 (65 ± 52) | <.001 |
| No. of stent-retriever passes | 65 (2 ± 1) | 20 (2 ± 1) | 201 (4 ± 1) | <.001 |
| Acute carotid stenting | 26 (39.4) | 5 (25) | - | 1 |
| Postponed carotid stenting | 14 (21.2) | 0 (0) | - | 1 |
| Procedural complications | 22 (33.3) | 2 (10) | 22 (10.9) | <.001 |
| Ischemic extension | 21 (31.8) | 7 (35) | 35 (21) | .13 |
| Hemorrhagic transformation | | | | |
| Subarachnoid hemorrhage | 28 (42.4) | 8 (40) | 56 (28.3) | .01 |
| H-1 | 6 (9.1) | 0 (0) | 0 (0) | <.001 |
| H-2 | 6 (9.1) | 3 (15) | 24 (11.9) | .72 |
| PH-1 | 12 (18.2) | 3 (15) | 8 (4) | .001 |
| PH-2 | 3 (4.5) | 2 (10) | 16 (8) | .58 |
| sICH | 7 (10.6) | 0 (0) | 6 (3) | .02 |
| | 10 (15.2) | 1 (5) | 9 (4.5) | 0.01 |
| TICI 2b/3 | 42 (63.6) | 14 (70) | 166 (82.6) | .004 |
| mRS 0–2 | 27 (41.5) | 14 (70) | 104 (54.2) | .06 |
| mRS 6 | 15 (23.1) | 2 (10) | 25 (12.9) | .11 |

**Note:**—ATO indicates atherothrombotic tandem occlusion; DTO, dissection-related tandem occlusion; IICO, isolated intracranial occlusion; H-1, H-2, PH-1, PH-2, hemorrhagic transformation categorized according to the European Cooperative Acute Stroke Study criteria.

[a] Previously published.[19]

**On-line Table 2: The distribution of the stenosis degree in the different patient subgroups[a]**

| Cervical ICA Plaque Severity | All Patients ($n$ = 66) | Emergent CSA | | Postponed CSA ($n$ = 14) | No. CSA ($n$ = 26) |
|---|---|---|---|---|---|
| | | POF ($n$ = 10) | DOF ($n$ = 16) | | |
| Occlusive plaque | 59.1% (39/66) | 70.0% (7/10) | 56.3% (9/16) | 64.3% (9/14) | 53.8% (14/26) |
| Severe stenotic plaque (>70% stenosis) | 25.8% (17/66) | 30.0% (3/10) | 18.7% (3/16) | 35.7% (5/14) | 23.1% (6/26) |
| Moderate stenotic plaque (<70% stenosis) + occlusive thrombus | 6.1% (4/66) | 0.0% (0/10) | 12.5% (2/16) | 0.0% (0/14) | 7.7% (2/26) |
| Nonstenotic plaque + occlusive thrombus | 9.1% (6/66) | 0.0% (0/10) | 12.5% (2/16) | 0.0% (0/14) | 15.4% (4/26) |

**Note:**—POF indicates proximal occlusion strategy; DOF, distal occlusion first.

[a] No significant difference was observed in the distributions of the stenosis degree among the subgroups: "Emergent CSA/POF," "Emergent CSA/DOF," "Postponed CSA," and "No CSA" ($\chi^2$ test; $P$ = .09).

**On-line Table 3: Impact of recanalization strategy, prior antiplatelet and/or anticoagulation therapies, and IV rtPA on the recanalization success, sICH, infarct core extension, and good clinical outcome**

| Variables | TICI 2b/3 | | | sICH | | | ICE | | | mRS 0–2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes (No.) (%) | No (No.) (%) | $P$ Value | Yes (No.) (%) | No (No.) (%) | $P$ Value | Yes (No.) (%) | No (No.) (%) | $P$ Value | Yes (No.) (%) | No (No.) (%) | $P$ Value |
| DOF ($n$ = 20) | 15 (75) | 4 (66.7) | 1 | 2 (10) | 4 (66.7) | .01 | 5 (25) | 3 (50) | .33 | 10 (52.6) | 4 (66.7) | .66 |
| Prior antiplatelet and/or anticoagulation ($n$ = 15) | 11 (73.3) | 31 (60.8) | .54 | 4 (26.7) | 6 (11.8) | .22 | 6 (40) | 15 (29.4) | .53 | 6 (40) | 21 (42) | 1 |
| IV tPA ($n$ = 40) | 25 (62.5) | 17 (65.4) | 1 | 5 (12.5) | 5 (19.2) | .50 | 11 (27.5) | 10 (38.5) | .42 | 16 (40) | 11 (44) | .8 |

**Note:**—ICE indicates infarct core extension; DOF, distal occlusion first.

**On-line Table 4: Baseline demographic features, procedural data, and clinical outcome in the atherothrombotic TO and dissection-related TO groups**

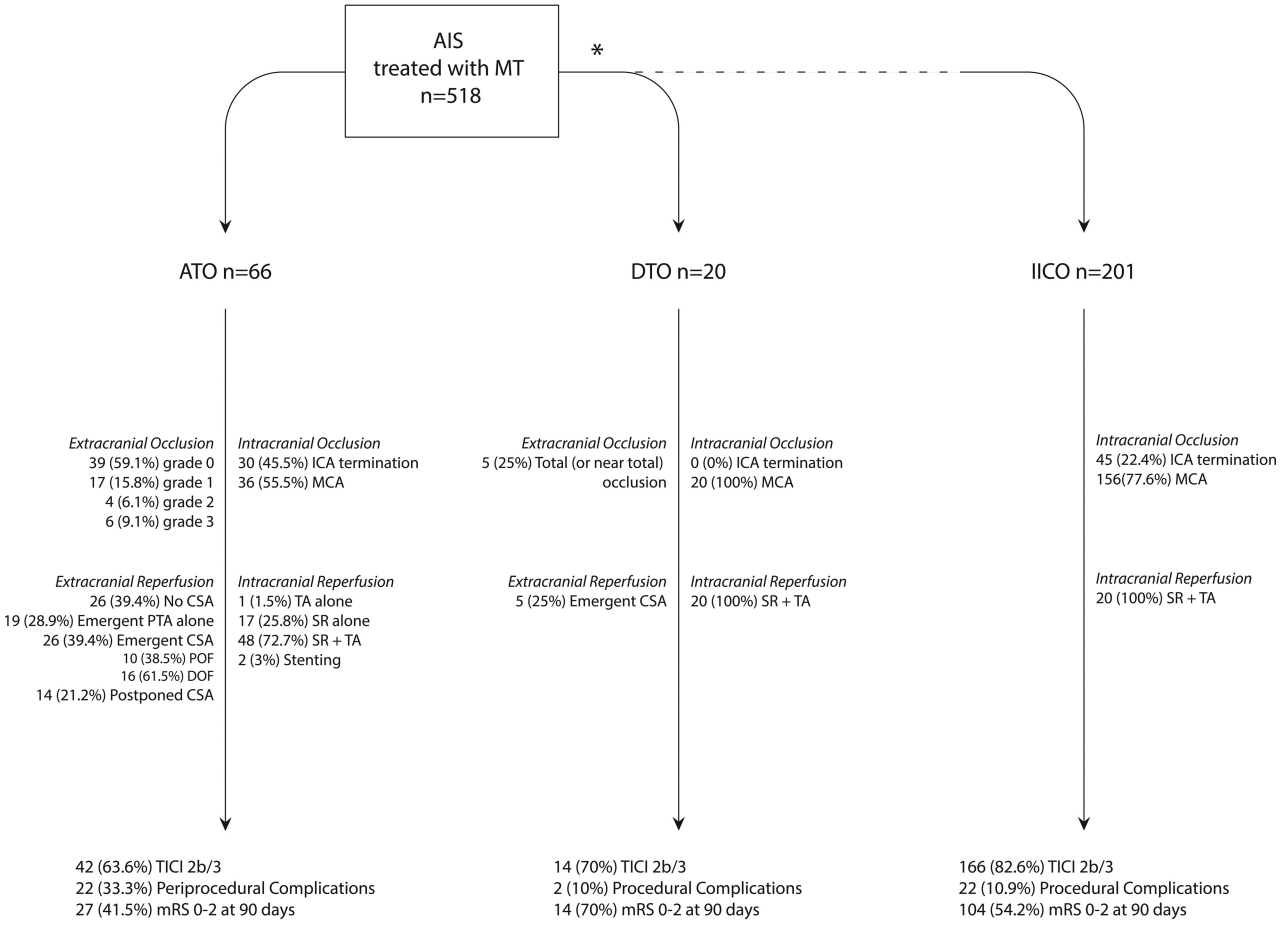
| | ATO Group No. (%) or (Mean) | DTO Group No. (%) or (Mean) | *P* Value |
|---|---|---|---|
| Age (yr) | 66 (67 ± 10) | 20 (52 ± 10) | <.001 |
| Men | 49 (74.2) | 14 (70) | .78 |
| Hypertension | 33 (50) | 6 (30) | .13 |
| Cigarette smoking | 39 (59.1) | 5 (25) | .01 |
| Dyslipidemia | 25 (37.9) | 4 (20) | .18 |
| Diabetes | 11 (16.7) | 1 (5) | .28 |
| Left side | 40 (60.6) | 14 (73.7) | .42 |
| Distal occlusion | | | |
| ICA termination | 30 (45.5) | 0 (0) | <.001 |
| MCA | 36 (55.5) | 20 (100) | <.001 |
| Baseline NIHSS score | 66 (17 ± 6) | 19 (18 ± 4) | .97 |
| Baseline DWI–ASPECTS | 65 (7 ± 2) | 19 (7 ± 1) | .43 |
| IV tPA | 40 (60.6) | 15 (75) | .30 |
| Onset-reperfusion time (min) | 57 (386 ± 160) | 16 (313 ± 93) | .09 |
| Procedural time (min) | 59 (82 ± 44) | 13 (81 ± 34) | .92 |
| No. of stent-retriever passes | 65 (2 ± 1) | 20 (2 ± 1) | .91 |
| Acute stenting | 26 (39.4) | 5 (25) | .30 |
| Postponed carotid stenting | 14 (21.2) | 0 (0) | 1 |
| Procedural complications | 22 (33.3) | 2 (10) | .05 |
| Ischemic extension | 21 (31.8) | 7 (35) | .79 |
| Hemorrhagic transformation | 32 (48.5) | 8 (40) | .61 |
| Subarachnoid hemorrhage | 6 (9.1) | 0 (0) | .33 |
| H-1 | 6 (9.1) | 3 (15) | .43 |
| H-2 | 12 (18.2) | 3 (15) | 1.00 |
| PH-1 | 3 (4.5) | 2 (10) | .33 |
| PH-2 | 7 (10.6) | 0 (0) | .19 |
| sICH | 10 (15.2) | 1 (5) | .45 |
| TICI 2b/3 | 42 (63.6) | 14 (70) | .79 |
| mRS 0–2 | 27 (41.5) | 14 (70) | .04 |
| mRS 6 | 15 (23.1) | 2 (10) | .34 |

**Note:**—ATO indicates atherothrombotic tandem occlusion; DTO, dissection-related tandem occlusion.

**On-line Table 5: Baseline demographic features, procedural data, and clinical outcome in the atherothrombotic TO and isolated intracranial occlusion groups**

| | ATO Group No. (%) or (Mean) | IICO Group No. (%) or (Mean) | *P* Value |
|---|---|---|---|
| Age (yr) | 66 (67 ± 10) | 201 (66 ± 15) | .54 |
| Men | 49 (74.2) | 91 (45.3) | <.001 |
| Hypertension | 33 (50) | 114 (57) | .39 |
| Cigarette smoking | 39 (59.1) | 54 (26.9) | <.001 |
| Dyslipidemia | 25 (37.9) | 66 (32.8) | .46 |
| Diabetes | 11 (16.7) | 27 (13.4) | .54 |
| Left side | 40 (60.6) | 88 (45.4) | <.001 |
| Distal occlusion | | | |
| ICA termination | 30 (45.5) | 45 (22.4) | <.001 |
| Middle cerebral artery | 36 (55.5) | 156 (77.6) | <.001 |
| Baseline NIHSS score | 66 (17 ± 6) | 201 (18 ± 5) | .99 |
| Baseline DWI—ASPECTS | 65 (7 ± 2) | 193 (7 ± 2) | .27 |
| IV tPA | 40 (60.6) | 138 (68.7) | .23 |
| Onset-reperfusion time (min) | 57 (386 ± 160) | 157 (332 ± 112) | .05 |
| Procedural time (min) | 59 (82 ± 44) | 126 (65 ± 52) | <.001 |
| No. of stent-retriever passes | 65 (2 ± 1) | 201 (4 ± 1) | <.001 |
| Acute stenting | 26 (39.4) | 0 (0) | <.001 |
| Procedural complications | 22 (33.3) | 22 (10.9) | <.001 |
| Ischemic extension | 21 (31.8) | 35 (21) | .09 |
| Hemorrhagic transformation | 32 (48.5) | 56 (28.3 | .004 |
| Subarachnoid hemorrhage | 6 (9.1) | 0 (0) | <.001 |
| H-1 | 6 (9.1) | 24 (11.9) | .66 |
| H-2 | 12 (18.2) | 8 (4) | .001 |
| PH-1 | 3 (4.5) | 16 (8) | .42 |
| PH-2 | 7 (10.6) | 6 (3) | .02 |
| sICH | 10 (15.2) | 9 (4.5) | .01 |
| TICI 2b/3 | 42 (63.6) | 166 (82.6) | .002 |
| mRS 0–2 | 27 (41.5) | 104 (54.2) | .09 |
| mRS 6 | 15 (23.1) | 25 (12.9) | .07 |

**Note:**—ATO indicates atherothrombotic tandem occlusion; IICO, isolated intracranial occlusion.




**ON-LINE FIGURE.** Flow chart of the main study design and results. Stenosis degree on DSA images was graded as 0 = occlusive plaque, 1 = severe stenotic plaque (>70% of stenosis), 2 = moderate stenotic plaque with occlusive thrombus (<70% of stenosis), and 3 = nonstenotic, but with ulcerated plaque with occlusive thrombus. The *asterisk* indicates that patients with atherothrombotic tandem occlusion were compared with those with dissection-related tandem occlusion and those with IICO from the same study period (from September 2009 to April 2015) that we previously published.[19] PTA indicates percutaneous transluminal angioplasty; POF, proximal occlusion first strategy; DOF, distal occlusion first strategy; TA, thromboaspiration; SR, stent retriever; IICO, isolated intracranial occlusion.