

Solitaire stent retriever failure during thrombectomy: is there any image that can predict non-recanalization?

Falha do Solitaire Stent retriever durante a trombectomia: há alguma imagem que pode prever a não recanalização?

Igor PAGIOLA^{1,2}, Bruno AMARAL¹, Celso SAITO¹, Dárcio NALLI¹, Henrique CARRETE JUNIOR¹, Michel Eli FRUDIT¹

Thrombus configuration^{1,2} may induce variability in artery recanalization.

The “closed tripod sign” (CTS) could be interpreted as poor stent apposition due to the high clot density and low rates of recanalization (Figure 1).

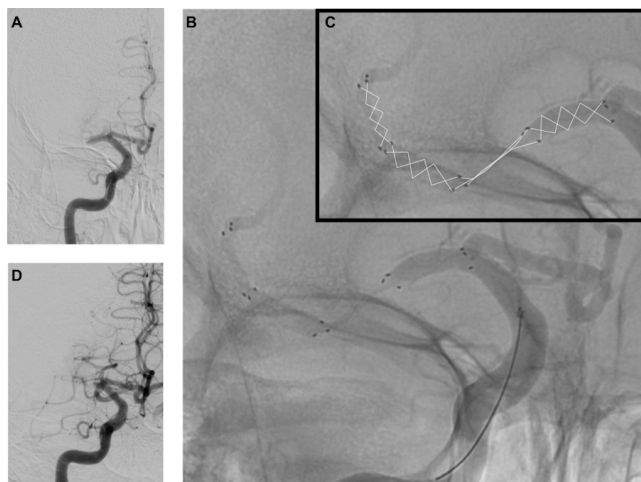


Figure 1. A) Initial digital subtraction angiography (DSA) of the right internal carotid artery (ICA) with distal M1 occlusion; B) no subtraction image from the right ICA with a 4x40 mm Solitaire platinum stent retriever (ev3/Covidien, Irvine, CA, USA) with the typical 3 radiopaque markers every 10 mm; C) illustration of the probable stent apposition (white lines represent the stent mesh), with poor apposition in the clot position, and the “closed tripod sign” is not visible due to the clot position between the radiopaque markers; D) right ICA DSA control after the first passage of the stent retriever technique with occlusion of the proximal part of the M1 segment, and the thrombus probably rolled between the stent mesh and the artery wall.

If CTS is visualized during the procedure, the stent retriever technique may be substituted for the aspiration-retriever technique for stroke (ARTS)³ with the blind exchange maneuver described by Nogueira et al.⁴ (Figure 2). For large vessel occlusion (LVO) strokes of the

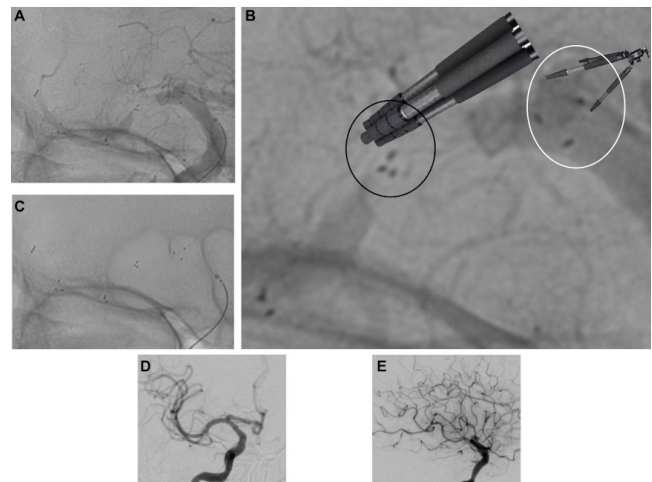








Figure 2. A) Right internal carotid artery (ICA) with no digital subtraction angiography (DSA) image and the Solitaire platinum 4x40 mm in the second passage; B) zoom image showing the 3 radiopaque markers closed in the clot position with the “closed tripod sign” and the proximal 3 radiopaque markers completely open in the artery (open tripod); C) image from Solitaire without contrast and subtraction; D) anteroposterior (AP) view of the right ICA DSA after the aspiration-retriever technique for stroke (ARTS) with Solitaire 4x40 mm and ACE 68 aspiration catheter (Penumbra, Alameda, California, USA), with thrombolysis in cerebral infarction (TICI) 3 recanalization with one passage; E) lateral view of the right ICA DSA.

¹Universidade Federal de São Paulo, Disciplina de Neurorradiologia Intervencionista, São Paulo SP, Brazil.

²Hospital Estadual Central, Disciplina de Neurorradiologia Intervencionista, Vitória ES, Brazil.

Igor PAGIOLA  <https://orcid.org/0000-0001-9052-7946>; Bruno AMARAL  <https://orcid.org/0000-0002-5584-8151>; Celso SAITO  <https://orcid.org/0000-0002-0814-8806>; Dárcio NALLI  <https://orcid.org/0000-0002-3078-2547>; Henrique CARRETE JUNIOR  <https://orcid.org/0000-0003-2972-163X>; Michel Eli FRUDIT  <https://orcid.org/0000-0003-3882-0226>

Conflict of interest: There is no conflict of interest to declare.

Authors' contribution: All authors contributed equally to this work.

Received on March 9, 2020; Received in its final form on April 20, 2020; Accepted on July 19, 2020.



anterior circulation, we always use the balloon guide catheter (Cello, ev3/Covidien, Irvine, CA, USA).

CTS was visualized after Solitaire deployment, the Rebar catheter was withdrawn, and blind advancement of the ACE68 was performed over the bare retriever

delivery wire (blind exchange). ACE68 was advanced until clot contact, and the aspiration was blocked. Stent and ACE68 were pulled as a unit (Figure 3). After this maneuver, thrombolysis in cerebral infarction (TICI) 3 was achieved.

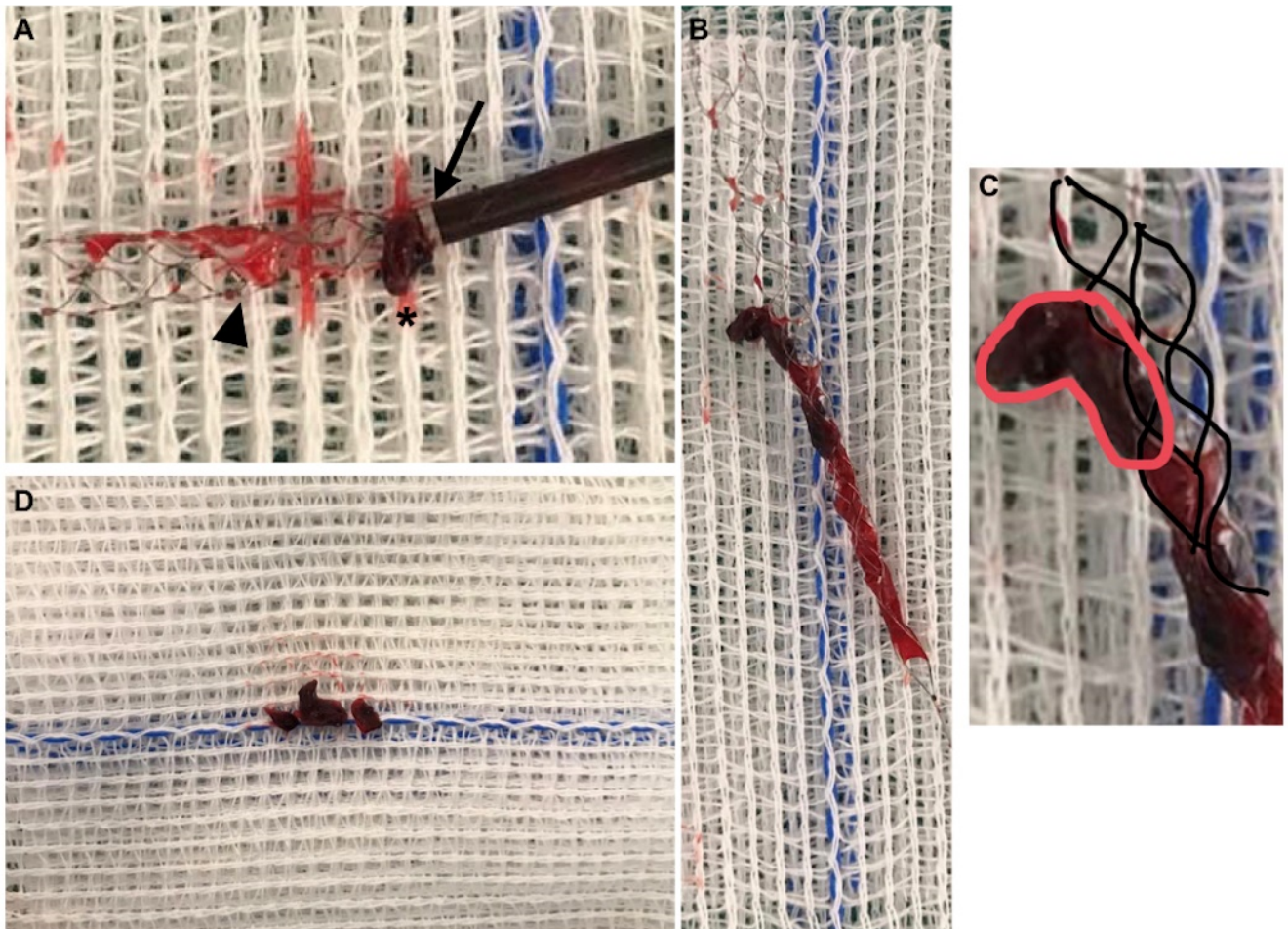


Figure 3. A) Solitaire (arrowhead) + ACE 68 (arrow) and the clot (*) were pulled like a unit without entering the “closed tripod sign” position inside the aspiration catheter to avoid the phenomenon of squeezing toothpaste tube and causing an embolization of the distal part of the thrombus; B) ACE 68 was withdrawn to analyze the clot interaction with the stent; C) the distal part of the clot (red line) was outside the stent mesh (black line) due to the bulky/rubbery clot, and retrieving this type of thrombus could be impossible with only the stent because it might roll between the stent mesh and artery wall. The proximal part of the clot was aspirated by the ACE 68, and the stent+ACE 68 unit was able to retrieve this tough clot; D) after manual manipulation to separate the clot and the stent, the “L” aspect of the proximal part of the clot did not change, showing the clot resilience due to the rigidity of this type of thrombus.

References

1. Mokin M, Morr S, Natarajan SK, Lin N, Snyder KV, Hopkins LN, et al. Thrombus density predicts successful recanalization with Solitaire stent retriever thrombectomy in acute ischemic stroke. *J Neurointerv Surg*. 2015 Feb;7(2):104-7. <https://doi.org/10.1136/neurintsurg-2013-011017>
2. Maekawa K, Shibata M, Nakajima H, Mizutani A, Kitano Y, Seguchi M, et al. Erythrocyte-rich thrombus is associated with reduced number of maneuvers and procedure time in patients with acute ischemic stroke undergoing mechanical thrombectomy. *Cerebrovasc Dis Extra*. 2018 Jan;8(1):39-49. <https://doi.org/10.1159/000486042>
3. Massari F, Henninger N, Lozano JD, Patel A, Kuhn AL, Howk M, et al. ARTS (Aspiration-Retriever Technique for Stroke): Initial clinical experience. *Interv Neuroradiol*. 2016 Jun;22(3):325-32. <https://doi.org/10.1177/1591019916632369>
4. Haussen DC, Al-Bayati AR, Eby B, Ravindran K, Rodrigues GM, Frankel MR, et al. Blind exchange with mini-pinning technique for distal occlusion thrombectomy. *J Neurointerv Surg*. 2020 Apr;12(4):392-5. <https://doi.org/10.1136/neurintsurg-2019-015205>