

Retrieval of floating clot in the internal carotid artery: extracranial SAVE technique (eSAVE)

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ABSTRACT

Acutely ruptured atherosclerotic plaques with adjacent floating clot within the internal carotid artery in patients suffering from extra-/intracranial tandem lesions are often treated with stent-assisted balloon angioplasty. We present a strategy to retrieve the extracranial thrombus using the “stent retriever assisted vacuum-locked extraction” (SAVE) method, which initially was described for the intracranial vasculature. The extracranial SAVE (eSAVE) method could be an additional tool for the treatment of acute tandem lesions.

In a subgroup of stroke patients suffering from cerebral large vessel occlusion (LVO), an additional extracranial lesion of the internal carotid artery (ICA) can be present, for example an acutely ruptured atherosclerotic plaque with adjacent floating clot within the ICA. To overcome such a vulnerable carotid lesion, different strategies exist including stent angioplasty or aspiration via large-bore catheters. We present the first case of a successful extracranial carotid artery recanalization by using the “stent retriever assisted vacuum-locked extraction” (SAVE) method, which is so far only described in the intracranial vasculature (1), consisting of clot entrapment by wedging the thrombus between the aspiration catheter tip and stent retriever while simultaneous withdrawal of the unit is executed under continuous proximal and distal aspiration as well as proximal protection with a balloon-guide catheter, the so called “extracranial SAVE” (eSAVE) technique.

Technique

A 47-year-old patient was admitted to our hospital with an acute right-sided hemiparesis and dysarthria on awakening. National Institutes of Health Stroke Scale (NIHSS) was 14. Baseline computed tomography (CT) demonstrated a large infarction of the middle cerebral artery territory with an Alberta stroke program early CT score of 5 due to a left-sided occlusion of the middle cerebral artery. Furthermore, a floating clot due to plaque rupture of the ipsilateral ICA was detected. CT perfusion demonstrated an existing mean transit time/cerebral blood volume mismatch in the affected territory. The patient was transferred to the angio suite for endovascular therapy.

At first, an 8 French (F) balloon-guide catheter (Flowgate 2, Stryker) was navigated into the left common carotid artery. After interdisciplinary discussion, stent angioplasty and loading with aspirin was avoided due to the large area of infarction.

Instead, an extracranial stent retriever embolectomy was done with proximal and distal aspiration as well as balloon-guide catheter protection based on our experience with the SAVE technique (1). Therefore, a 0.014-inch microwire (Transend, Stryker) and microcatheter (Trevor Pro 18, Stryker) was carefully advanced into the distal ICA and a 6×30 mm stent retriever (Trevor ProVue XP, Stryker) was placed primarily distally to and with the proximal half across the clot. After retracting the microcatheter, a 6 F aspiration catheter (Catalyst 6, Stryker) was advanced to the proximal face of the clot and the aspiration pump was connected and activated. The proximal balloon was inflated and the stent retriever was gently retracted, while the tip of the aspiration catheter was further advanced until a wedge po-

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sition was reached, indicating clot entrapment between stent retriever and aspiration catheter. The negative pressure within the aspiration catheter was then retained with the use of a 60 mL vacuum syringe (VacLok, Merit Medical) and the aspiration pump was connected to the guide catheter. The stent retriever and aspiration catheter were then withdrawn into the guide catheter as a unit. The thrombus was retrieved completely without loss of fragments to the distal vasculature with residual stenosis of the proximal ICA (Fig.). Then, the intracranial LVO was recanalized successfully with the same maneuver (1). After exclusion of an intracranial hemorrhage and loading with dual antiplatelets, the ICA stenosis was treated with stent angioplasty 7 days after the first procedure.

The patient was discharged after 12 days with pronation of the right extremities and an NIHSS of 4. Approval of the ethics committee was given to evaluate data (No: 13/7/15An) and patient's written consent for publication was obtained after the intervention.

Discussion

Treatment of the extracranial lesion in patients suffering from an emergent tandem occlusion is a matter of debate. While it is mandatory to recanalize the intracranial LVO as fast as possible, different strategies exist for therapy of the concomitant ICA lesion dependent on the etiology. In our case, a floating clot within the ICA had to be retrieved within the initial procedure as the loss of thrombus might have led to an intracranial carotid T occlusion with the complication of an anterior territory thrombosis. Some authors favor acute treatment of the carotid artery using stent-assisted balloon angioplasty in this situation (2); however, as the patient had a prominent infarction

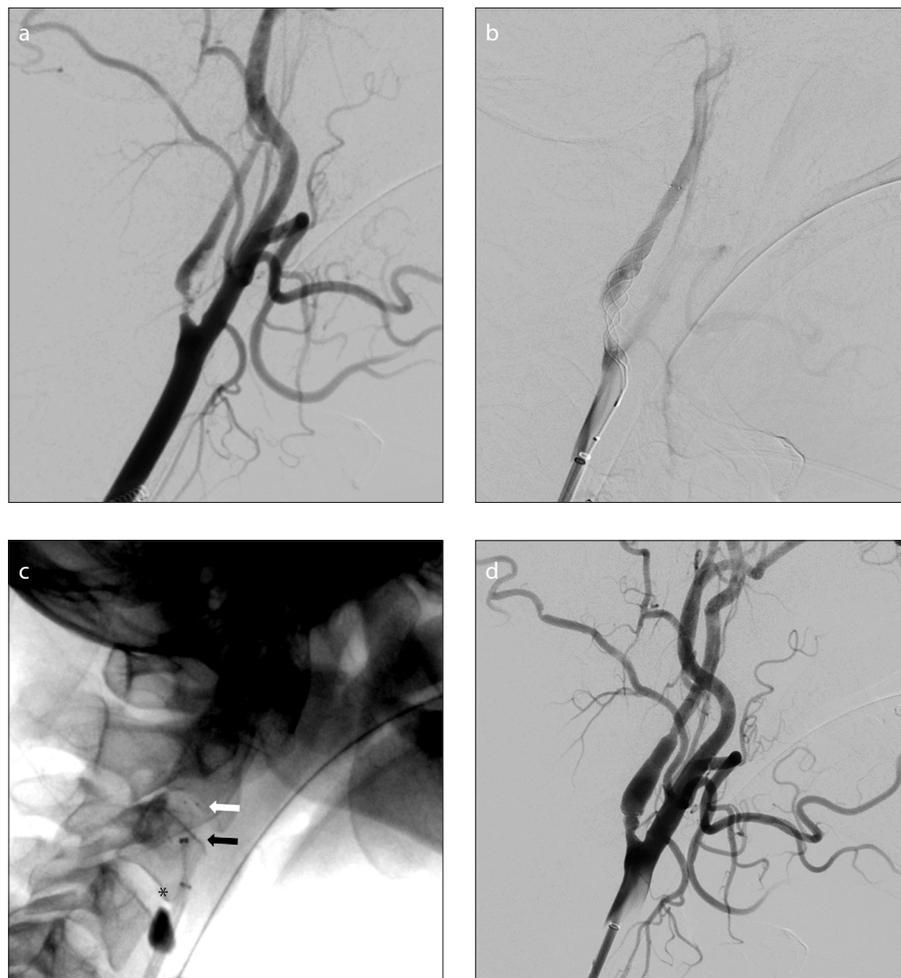


Figure. a–d. Panel (a) shows lateral angiogram of the floating clot within the internal carotid artery based on an atherosclerotic plaque. Panel (b) shows deployment of a stent retriever with the proximal half across the clot. After the balloon of the guide catheter (c, asterisk) is inflated, the tip of the aspiration catheter (black arrow) is advanced to the proximal face under aspiration of the clot and the stent retriever is slightly retrieved until a wedged position is achieved. Typically, the stent retriever (distal markers are highlighted with the white arrow) is partially retrieved into the aspiration catheter and subsequently both are removed as a unit (proximal markers are covered by the inflated balloon). Image (d) shows complete retrieval of the clot with residual stenosis of the internal carotid artery, which was treated several days later, after an intracranial hemorrhage was excluded (not shown).

(ASPECTS 5) on initial imaging we explicitly decided against acute stenting in order to prevent the occurrence of an intracranial hemorrhage. The avoidance of antithrombotic medication in the emergent situation has a potential risk for acute re-thrombosis of the extracranial lesion as this technique may further potentiate vascular injury by irritating the inner layer of the vessel and atherosclerotic plaque, which might be a disadvantage of eSAVE. Another alternative would have been the use of clot aspiration; however, we and other colleagues believe that particularly soft clots might fragment as distal protection is missing (3). We decided for the extracranial variant of the SAVE technique (eSAVE) as our experience with this method in the intracranial vasculature

is promising with high rates of complete reperfusion. Main aspects of SAVE are proximal and distal capture of the clot by the distally placed stent retriever and the proximal aspiration catheter with additional continuous aspiration via the guide catheter, which reduces probability of fragment loss. The use of a proximal balloon-guided catheter furthermore decreases antegrade blood flow within the affected ICA.

In conclusion, stent retriever embolectomy using eSAVE in patients suffering from acute thrombosis of the extracranial carotid artery could be another tool for the treatment of tandem lesions. However, the effectiveness of eSAVE has to be proven in a larger cohort.

Conflict of interest disclosure

The authors declared no conflicts of interest.

Main points

- Different strategies exist for treatment of acutely ruptured atherosclerotic plaques with adjacent floating clot within the internal carotid artery.
- Main aspects of SAVE are proximal and distal capture of the clot by the distally placed stent retriever and the proximal aspiration catheter with additional continuous aspiration via the guide catheter.
- The extracranial SAVE (eSAVE) method could be another tool for the treatment of acute tandem lesions.

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