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Case Report

Double stent retriever technique for rescue recanalization in refractory large vessel occlusions ^{☆,☆☆}

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ABSTRACT

Acute ischemic stroke patients with large vessel occlusion (LVO) involving bifurcation usually have a difficult and high clot burden. By using conventional technique often resulting in a reduction in the possibility of successful recanalization. The double stent retriever technique can be considered for rescue recanalization. We reported a case of refractory terminal left internal carotid occlusion that was treated using double stent retriever technique. Two microcatheter were advanced across the occlusion were one to the superior branch of middle cerebral artery and another was on inferior branch. Both stent retrievers were pulled back together and complete recanalization was achieved. This technique were reported in some case series to be effective and based on our initial experience using this technique it seems the expansion improved after deployment of the second stent retriever and it traps the clot within its stent struts, to facilitate clot retrieval. Therefore, double stent retriever technique can be one of the choices for rescue recanalization in refractory clot occlusion and it may potentially help other clinicians in similar situations.

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Introduction

A stent retriever is the current standard technology of mechanical thrombectomy (MT) for acute ischemic stroke pa-

tients with LVO [1]. Vessel recanalization is the goal of MT and approximately one-third of patients with large vessels occlusion fail to achieve complete recanalization [2,3]. Currently, there are several techniques how to improve high recanalization rates, especially when combined-technique of stent

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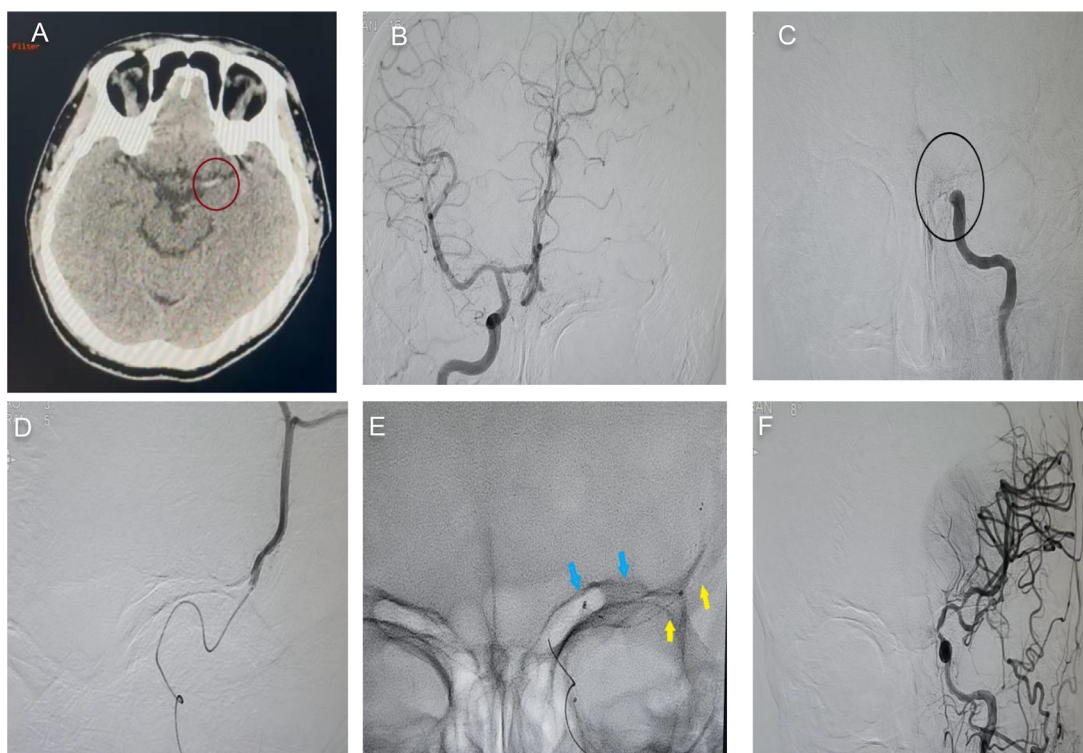


Fig. 1 – (A) Axial computed tomography (CT) scan of the head showing middle cerebral artery (MCA) dense sign in Left side (red circle). A cerebral digital subtraction angiography in anteroposterior from the right internal carotid artery (ICA) showed preserved left anterior cerebral artery vascularization through Acom (B). Injection from left ICA showed total occlusion from distal part of cavernous segment (black circle) which is suspected until M1 segment of MCA based on CT scan (C). Selective injection showed the microcatheter has passed beyond the clot and 2 mechanical thrombectomy was attempted with no recanalization (D) Double stent retriever technique was performed with 2 microcatheters placed in superior segment (blue arrow) and inferior segment of MCA (yellow arrow) (E) with complete recanalization (F).

retriever (SR) and aspiration catheter are used with a successful rate of recanalization > 80% [4]. Unfortunately, clot burden and bifurcation location cannot be always predicted before the MT is performed, therefore failure of revascularization in refractory thromboembolic occlusions still exist even after applying combined-technique [3,5]. Recently, double stent retriever technique has been reported as a rescue thrombectomy to improve clot-capturing ability, it is necessary to report more cases with this technique and analyzing its effectiveness [5–9].

In this report, we present a case of bifurcation refractory occlusion in the left supraclinoid internal carotid artery (ICA) extending to M1 segment of middle cerebral artery (MCA) treated with the “double SR technique” as a rescue recanalization after failed using a single stent retriever.

Case report

A 50-year-old male patient with risk factors of smoking and hypertension arrived at our emergency department Hospital presented 5 hours after the onset of stroke with complete right hemiplegia and global aphasia, National Institutes of Health Stroke Scale score (NIHSS) was 18 at the time admission. The

noncontrast computed tomography (CT) of the brain did not reveal Space Occupying Lesion (SOL), or hemorrhage but left “MCA dense sign” was prominent with Alberta Stroke Program Early CT Score (ASPECT) was 7, (Fig. 1A). Intravenous thrombolysis was not given and the patient was transferred to the angi suite. The informed consent was signed by the legal representatives before the endovascular therapy procedure.

Digital subtraction angiography (DSA) demonstrated active anterior communicating (Acom) artery that gave good vascularization to the left anterior cerebral artery (ACA) territory from the right side (Fig. 1B) and occlusion of the left terminal ICA until M1 segment of left MCA was suspected (Fig. 1C). Bal-last 088 long sheath 90 cm (Balt USA LLC, Irvine, CA) was introduced into the distal cervical segment of Left Internal Carotid Artery (LICA). Headway 17 advanced straight microcatheter was navigated over the Guide Wire Traxcess 14 (MicroVention, Aliso Viejo, CA) at the M2 inferior segment of MCA and confirmation of a normal distal artery through microcatheter injection was done (Fig. 1D). Mechanical thrombectomy attempted with 2 passes of the eric retrieval device 6 × 44 mm (MicroVention, Aliso Viejo, CA) was unsuccessful. Therefore, we decided to perform double stent retriever technique for the next pass. Two microcatheters were navigated crossing the occlusion site, where one in the inferior division and another microcatheter Vasco 18 was navigated over Microwire Hybrid

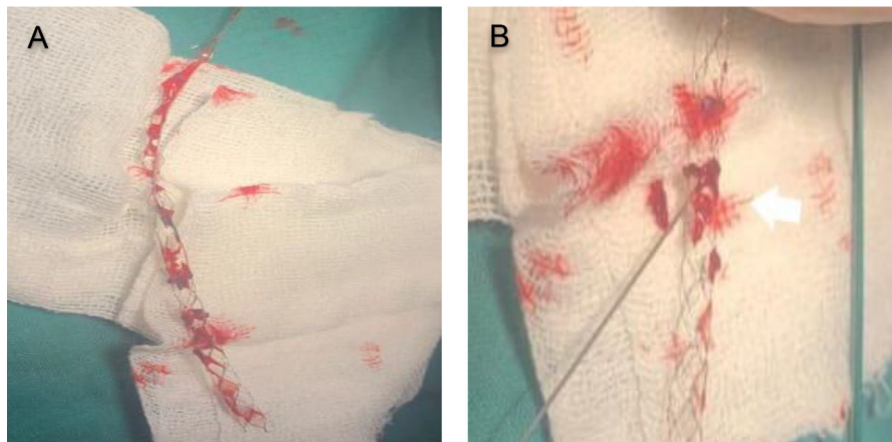


Fig. 2 – (A) Sticky hard clot was retrieved along the stent retriever especially at the point of left ICA bifurcation where double stent retriever showed its effectiveness and improving the 2 devices-clot interaction (white arrow) (B).

14 (Balt USA LLC, Irvine, CA) in the proximal superior division of MCA. First, an eric retrieval device 6 × 44 mm was deployed followed by Catch stent retriever 4 × 20 mm (Balt USA LLC, Irvine, CA) was deployed parallel to the first SR (Fig. 1E). Under manual aspiration through the longsheath, the 2 deployed SRs were slowly pulled back together, and sticky hard clot was retrieved (Fig. 2A and B). Final angiography confirmed TICI 3 recanalization (Fig. 1F). The time between groin puncture to final recanalization was 95 minutes. There was no dissection observed and no intracranial hemorrhage was found on follow up CT scan after 24 hours of MT. The patient has NIHSS 9 at discharge.

Discussion

Acute ischemic stroke patients with LVO involving bifurcation usually have a difficult and high clot burden, resulting in a reduction in the possibility of successful recanalization [3,7]. We reported a case of refractory terminal bifurcation ICA occlusion that was treated using the double SR technique. A single stent retriever could not trap the clot within its stent struts after 2 retrieval attempts. Previous studies had reported that the use of double stent retrievers can be used for rescue recanalization by improving the clot-capturing ability.

This case highlight the effectiveness of the double SR for refractory occlusion, especially at bifurcation location. There are several techniques of MT despite using only SR or contact aspiration only, they are reported combination of both techniques may improve rate recanalization [4]. However, there are still some cases of refractory occlusion that cannot be recanalize using those techniques. Occlusion involving bifurcation usually has high clot burden, therefore many rescue strategies have been applied such as intra-arterial thrombolysis, rescue angioplasty, or intracranial stent placement [10,11]. In our case, we used long and larger diameter of stent retriever to facilitate capturing the clot and to reduce passing number during mechanical thrombectomy. Some reports showed longer stent retrievers enhance thrombectomy performance but un-

fortunately the efficacy is still limited [12,13]. After 2 retrieval attempts failed to recanalize, we carefully analyzed the vessels since the occlusions can be due to embolic material, intracranial atherosclerotic disease (ICAD) and sometimes they are caused by arterial dissection. Another technique was considered and double stent retriever was an option since the aspiration catheter was not available at that time in our angi-suite to perform combined technique and it has been reported as a novel thrombectomy technique in some literatures [14].

To facilitate this technique there are 2 possibilities way to perform SR deployment either using 2 stent retrievers are inserted in parallel by 2 microcatheter access to the 2 different branches (kissing-Y techniques) and then both stents are gradually retrieved out of the guiding catheter or after the deployment of the first SR, the second microcatheter crossing the first stent to access another branch (stent-in-stent double SR or crossing-Y technique).

It has been reported that there is no critically different between kissing-Y techniques and crossing-Y technique due to that the degree of stent expansion of the first SR still increase after adding the second SR either using those 2 methods [2]. The double SR technique need careful consideration of the risk and benefit because it has some potential disadvantages such as vessel injury, dissection and cost effectiveness issues compare of the simple stent MT.

Placement of the 2 microcatheter, type of stent retriever such as size and more radiopaque stent are important factors to be analyzed before doing this technique [2,15]. Most LVOs are caused by embolic materials and this material can be associated with internal carotid artery dissection. Terminal ICA bifurcation occlusion due to dissection is a very rare condition, accounting less than 2% of ischemic strokes, but it is very important point to analyze before doing aggressive MT especially by using double SR technique or it can make the situation worse and exacerbate the degree of the dissection [16]. However, it is very difficult to recognize the dissection in angiographic image alone. Sasaki et al. [17] reported one of the useful evaluation to analyze the dissection in angiographic image based on morphological changes and temporary restoration of blood flow during stent retriever deploy-

ment. Nevertheless, it must be kept in mind for the operator who performed this technique.

In our case, looking on the first angiography, recanalization on the ACA occlusion was not performed because of there is enough collateral flow via the contralateral Acom segment to supply the distal ACA territory so we prefer to navigate the 2 microcatheters in M2 superior and inferior divisions despite placing in the ACA-MCA bifurcation to prevent emboli of ACA more distally. We prefer using kissing-Y-stent-retriever method in our case due to perform crossing Y-stent-retriever MT requires a wire to be inserted through the first stent to the another branch, therefore radiopaque of the first stent should be optimal visualized or it will be difficult to perform this method and increasing the risk of vessel injury and perforation [2,3].

As a novel mechanical thrombectomy technique, double stent retriever MT might be reasonable strategy as a rescue technique after conventional MT failed to recanalize in selected cases. Clinicians should carefully perform this technique to reduce the risk and procedure-related complications.

Conclusion

After the unsuccessful standard retrieval with a single stent, the double stent retriever thrombectomy technique as a rescue treatment of refractory occlusion especially in bifurcation location can be one of the potential options after careful consideration of the potential risks. Further studies are needed to analyze the safety and effectiveness of this technique compared with other conventional techniques.

Author contribution

Conceptualization: ASA; Data curation: ASA; Formal analysis: ASA, RAD; Methodology: ASA; Project administration: RAD; Visualization: ASA, RAD; Writing - original draft: ASA, RAD; Writing - review & editing: ASA, RAD.

Patient consent

Written informed consent for the publication of this case report was obtained from a patient's family.

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