Case Report

Planned Stage Endovascular Treatment for Complex Wide Neck Aneurysm

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Abstract

Treatment of a complex, wide neck aneurysm sometimes cannot be achieved in a single endovascular session. This case illustrates a planned stage endovascular treatment of a complex aneurysm with remodeling technique aiming to eliminate risk of rebleeding during acute phase in the first stage of treatment, and complete occlusion in the second stage of treatment. After first stage, separation between coil mass and neck remnant was clearly shown indicating presence of neointimal layer. Multiple sessions also provide proper planning and more controlled treatment of difficult aneurysms.

Keywords: Endovascular treatment, wide neck aneurysm, stage treatment, remodeling technique, coiling.

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Introduction

The goal of treatment of a cerebral aneurysm is to achieve complete occlusion. Treatment of a complex, difficult wide neck aneurysm sometimes cannot be completed in a single endovascular session. Even in cases where good occlusions were achieved, the rate of recanalisation is high, particularly in large or giant wide neck aneurysms (1,2). With improvement of endovascular techniques, emergence of new materials and usage of stent (3,4,5), increased number of wide neck aneurysms' endovascular treatments resulted with good outcome. However, significant risk of morbidity does arise due to occasional failure to completely occlude the complex lesions in a single session.

Various authors reported different approaches to treat complex wide neck aneurysms. Planned dual-modality approaches for complex wide neck aneurysm, either by endovascular followed by microsurgical or vice versa (6). Our case illustrated a planned stage approach of endovascular technique (EVT) in treatment of a complex shape wide neck cerebral artery aneurysm.

Case Report

A 39-year-old lady presented with loss of consciousness for several minutes preceded by severe headache and vomiting. Prior consent was obtained for reporting the case. Computed Tomography (CT) Scan and Three-dimensional angiography confirmed the presence of subarachnoid haemorrhage (SAH) and giant lobulated aneurysm at the bifurcation of the left middle cerebral artery (MCA), which measured 15.0 x 6.2 mm in diameter (Figure 1). No neurological deficit was present.

First stage:

Procedure was done under general anaesthesia. Bifemoral catheterisations were performed using 6F sheaths and 2 guiding catheters (Envoy; Cordis,

Miami Lakes, FL). Full heparinasation (5000 IU bolus, followed by continuous infusion [2000-3000 IU/hour]) to keep the activated clotting time between 200 to 300 seconds and intravenous aspirin (250mg) were given at the beginning of the procedure. Balloon microcatheter (Hyperglide; Micro Therapeutics, Irvine, CA) and microcatheter (Nautica; Micro Therapeutics, Irvine, CA) with microguidewire (Synchro-14; Boston Scientific, Fremont, CA) were used to cannulate the sac of the aneurysm. Due to intrication of the aneurysm with the bifurcation, remodelling technique was used in which balloon microcatheter was inserted in the left fronto-temporal trunk. We decided to treat the larger lobe first, which was the sac of aneurysm, and treat the small lobe at the neck of aneurysm at a later stage. After a

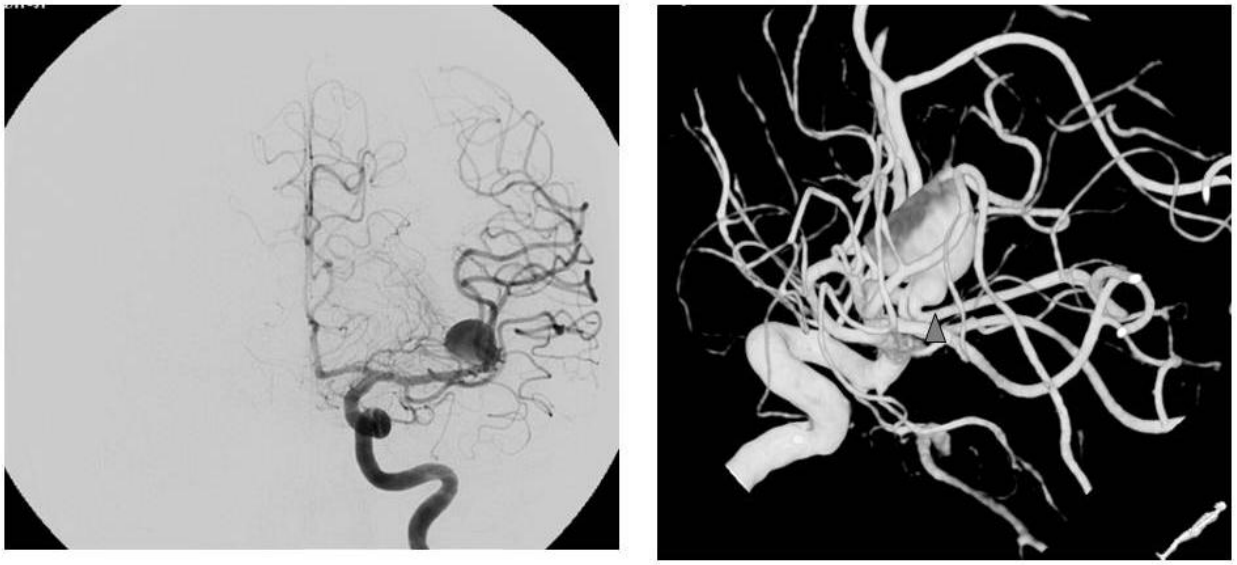


Figure 1: *Left:* Cerebral arteriography showed the aneurysm at the left MCA bifurcation. *Right:* Three-dimensional image showed the lobulated aneurysm with smaller first lobe (arrowhead) integrate with the MCA bifurcation and the second larger lobe superimposed on the first lobe.

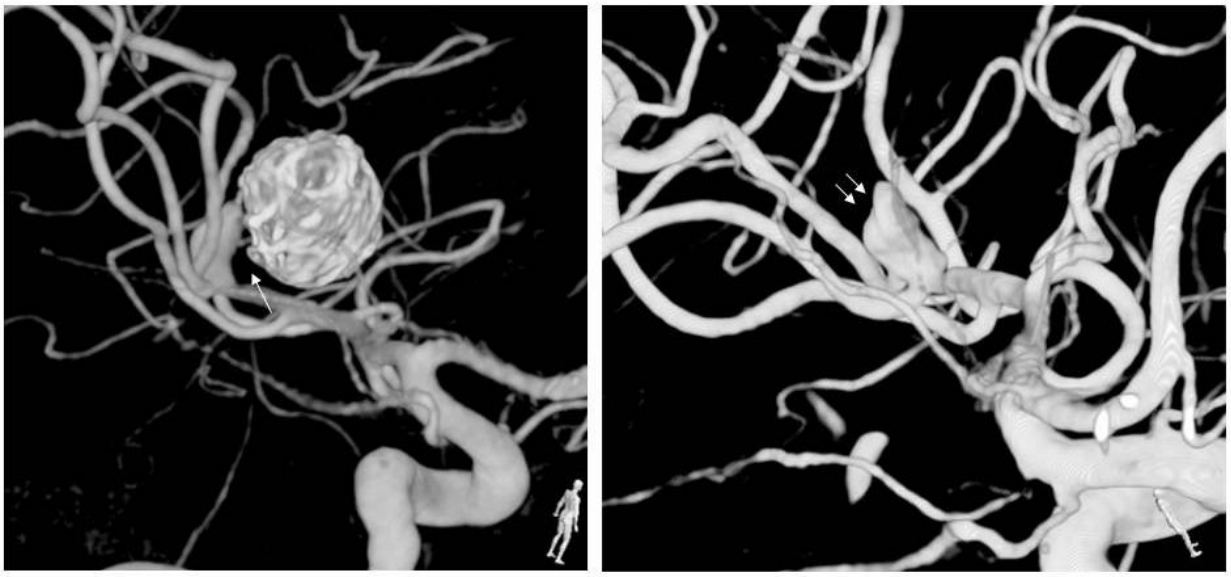


Figure 2: Post coiling after first stage treatment: *Left:* Three-dimensional image with coil mass showed clear separation between the coil mass and the neck remnant (arrow). *Right:* Three-dimensional image without the coil mass showed the neck remnant (double arrow) measuring 6.8 x 4.2 mm at the left MCA bifurcation.

relatively difficult cannulation of the sac and with the assistance of remodelling technique, we managed to place five coils (Boston Scientific, Fremont, CA) coils (2 - 14/30, 1- 12/30, 1 – 9/30 and 1 – 7/30) and two hydrocoils (1 – 12/20 and 1 – 10/15) in the aneurysm sac. Patient was well, post procedure. Second stage treatment was performed eight weeks following this initial treatment.

Second stage:

Procedure was performed under general anaesthesia. Bifemoral catheterisations were preformed using 6F sheaths and 2 guiding catheters (Envoy; Cordis, Miami Lakes, FL). Full heparinasation (5000 IU bolus, followed by continuous infusion [2000-3000 IU/hour]) to maintain the activated clotting time between 200-300 seconds and intravenous aspirin (250mg) were given at the beginning of the procedure. The three-dimensional angiography clearly showed the separation between the coils mass in the previously treated sac and the remnant of the aneurysm, suggesting the presence of neointimal layer (Figure 2).

The oblong shaped remnant of the neck measured 6.8 x 4.2mm. Balloon microcatheter (Hyperglide; Micro Therapeutics, Irvine, CA) and microcatheter (Nautica; Micro Therapeutics, Irvine, CA) with microguidewire (Synchro-14; Boston Scientific, Fremont, CA) were used to cannulate the neck remnant of the aneurysm.

The balloon was also placed in the fronto-temporal branch in order to assist the placement of coils in the remnant neck of aneurysm. We placed 4 coils (1- 4/8, 1- 4/6, 1- 2/4 and 1- 2/2) after which complete occlusion was achieved (Figure 3a, 3b).

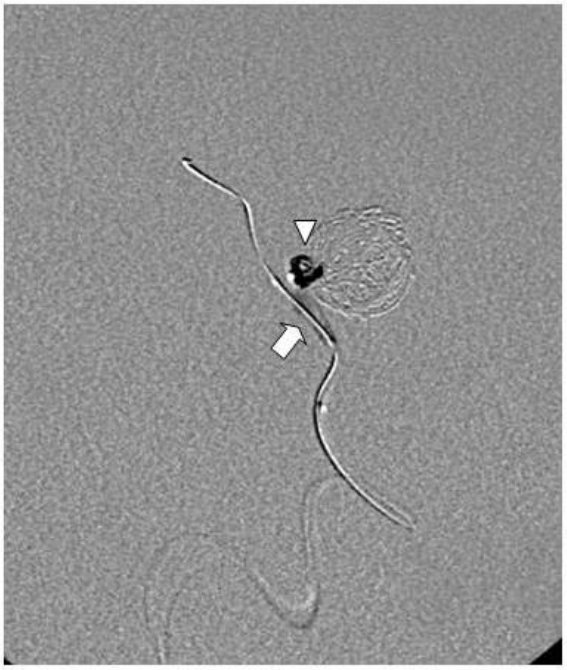
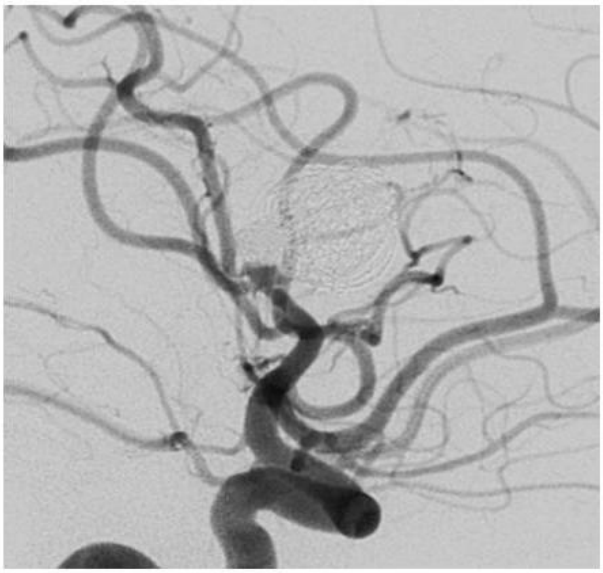


Figure 3: (a) Images of the second stage treatment: Inflated balloon (thick arrow) assisting the coil placement (arrowhead) at the neck remnant.



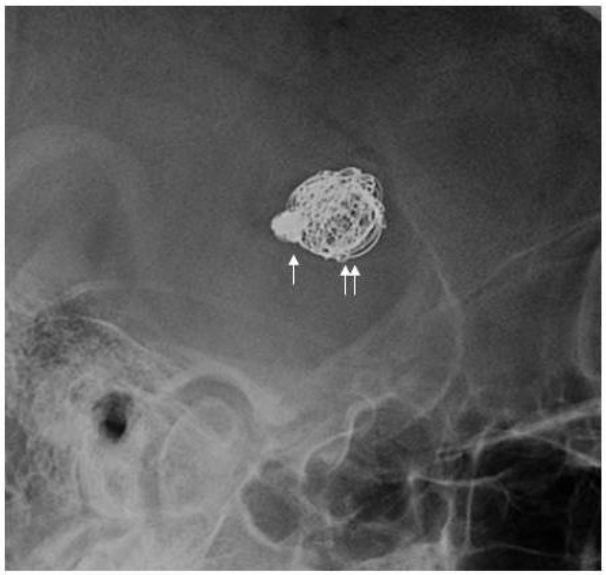


Figure 3(b): Images of the second stage treatment: *Left:* Angiography image showed complete occlusion of the neck remnant. *Right:* The coil mass in the sac of aneurysm for first stage treatment (double arrow) and the coil mass in the neck remnant for the second stage treatment (single arrow).

Discussion

The main aim of aneurysm treatment lies in the reduction or complete elimination of the risk of bleeding in un-ruptured aneurysm or re-bleeding in previously ruptured aneurysm. This is done by completely excluding the aneurysm from the parent artery by either surgical clipping or endovascular method preferably in a single session. Due to the complexity of the aneurysm in our case, it was decided that treatment would be done in two stages. This provided more controlled treatments without significantly undermining risk of re-bleeding. In the initial stage, the main aim was to prevent re-bleeding during acute phase by targeting the sac that has a higher risk of bleeding. The second stage was to occlude the remnant of the neck of aneurysm, hoping by that time the treated sac already thrombosed or partially healed. This would significantly reduce the risk of bleeding.

Prevention of re-bleeding during acute phase significantly reduces the risk of morbidity particularly in cases where complete occlusion cannot be achieved in one session. This case showed the presence of neointimal layer explicitly after a period of eight weeks post first stage endovascular session as seen in the three-dimensional angiography image (Figure 2) where the formation of neointimal layer separated the treated sac from the remnant of aneurysm. This enabled the next stage of treatment to be carried out with lesser risk as the higher risk portion was already treated and had a good neointimal layering. Studies have shown that by using the biologically active coils, which stimulate neointimal growth, will hasten healing and thus separate the aneurysm from its parent artery (7).

The balloon-assist or remodelling technique originally described earlier is an adjunctive technique where a balloon is placed at the neck of aneurysm to assist deployment of coils (5). The temporary inflation of the balloon prevents herniation of coils into the parent vessels thus allowing denser packing and helps mould the coil mass. In this patient, balloon-assist technique was used in both stages, more importantly in the second stage to allow dense packing of the neck remnant. This resulted in good packing for the sacs and complete occlusion of the aneurysm.

Conclusion

Treating an aneurysm can be done using planned multiple endovascular sessions and it provides safe and more controlled treatment particularly in a difficult case. Reducing the risk of bleeding during acute phase should be the main aim in the initial stage.

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