Stent displacement during the Y-stent assisted coil embolization of wide-neck basilar tip aneurysm

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Abstract: Y-stent technique has been widely used in the treatment of wide-neck basilar tip aneurysm. Compared to single stent assisted technique, one of the distinguished complications in Y-stent technique is the stent displacement. This is first report about analysis of stent displacement during the Y-stent assisted coil embolization of wide-neck basilar tip aneurysm. Two Cases with wide-neck basilar tip aneurysm were initially planned to introduce Y-stent assisted coil embolization; however, inadvertent migration of stent occurred during the procedure. In one case, the distal portion of the displaced stent migrated into the aneurysm lumen. In another case, the proximal portion of the stent displaced, resulting in a horizontal stent across the aneurysm neck.The two aneurysms were successfully embolized preserving important vessels.These cases highlight the potential tendency of stent displacement during procedure of Y-stent technique of wide-neck basilar tip aneurysm. The former stent seems to displace more easily than the latter stent, and longer length of stent may reduce the incidence of stent displacement.
[Tan Song, Xu Hao-wen, Song Bo, Chandra Avinash, Xu Yu-ming. **Stent displacement during the Y-stent assisted coil embolization of wide-neck basilar tip aneurysm.** Life Science Journal. 2011;8(3):464-466] (ISSN: 1097-8135). http://www.lifesciencesite.com.

Key words: Stent; Displacement; Coil; Aneurysm; Wide neck

1. Introduction

Since bilateral PCA (posterior cerebral artery) and SCA (superior cerebellar artery) usually emanate from the lumen or neck of the basilar tip aneurysm. Single stent, dual microcatheter or balloon remodeling may not prevent coils from prolapsing into the parent artery1-3. However, Y-stent technique may be a good alternative where there is to place two stents from bilateral P1 segments to BA (basilar artery), one stent passing through the interstices of another stent in a Y-configuration. Although there have been several reports of treating wide-neck basilar tip aneurysm with Y-stent technique successfully, nevertheless, the reports of complication of stent displacement are scarce4. Below are two cases with a wide-neck basilar tip aneurysm involving the stent displacement during the procedure of Y-stent technique.

2. Typical Patient 1

A 64–year-old man presented with SAH and Hunt-Hess grade II. Cerebral angiography demonstrated a 10×10×12 mm wide-neck basilar tip aneurysm (Fig 1-A). The condition of aneurysm and related vessels caused that Y-stent assisted coil embolization was suitable for the treatment of such aneurysm. Following induction of general anesthesia, a 6 F guide catheter (Envoy; Cordis) was navigated to the right vertebral artery. The patient was heparinized to an activated clotting time of 250 to 300 seconds. A 300 cm, 0.014 inch Transcend Floppy microwire (Boston Scientific) was placed into the left P3 segment and a 3.5 × 20 mm neuroform-3 stent delivery system (Boston Scientific) was positioned across the aneurysm neck through the microwire. The stent was subsequently deployed from left P1 segment back into BA (Fig 1-B). Abciximab was administered intravenously.

However, during the process of pulling back the microwire into the BA tip and then advancing the microwire into the right PCA through the interstices of the stent, the distal portion of stent migrated into the aneurysm lumen. No contrast was observed to leak from the aneurysm (Fig 1-C). The aneurysm was embolized with single stent assisted technique. An Excelsior 10 microcatheter was advanced into the dome of the aneurysm, and coil embolization proceeded in the usual fashion (Matrix 2, 360; Boston Scientific) (Fig1-D), however, the left side of the neck could not be packed tightly without coil loops herniation into the parent artery. Y-stent technique was reconsidered. Using the above method, a 4.0× 20 mm neuroform 3 stent delivery system was placed through interstices of the first stent from left P1 segment to BA and then deployed, no stent displacement occurred. A so-called "Y" configuration was thus established (Fig1-E). Coil embolization proceeded in the usual fashion. Complete obliteration of the aneurysm cavity was

obtained without any compromise of distal flow (Fig1-F). The patient recovered completely.

Patient 1

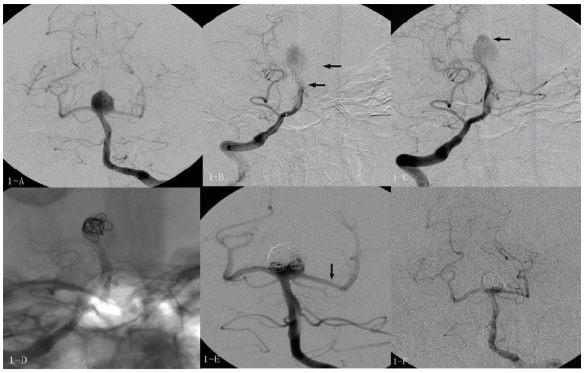

Fig 1-A. The wide-neck basilar tip large aneurysm with bilateral PCA involved; Fig 1-B. The neuroform stent was deployed from left P1segment to BA; Fig 1-C. The distal portion of the stent migrated into the aneurysm; Fig 1-D.With single stent assisted technique; the coil was placed into the aneurysm lumen, the left portion of the aneurysm neck remained Fig 1-E, F. With Y- stent assisted technique, the aneurysm was embolized successfully and important vessels were preserved.

3. Typical Patient 2

A 29-year-old man presented with SAH and Hunt-Hess grade III. Cerebral CT showed subarachnoid hemorrhage in suprasellar cistern and cisterna ambiens. Cerebral angiography demonstrated a giant basilar tip aneurysm with wide neck (17×20 × 20 mm), bilateral PCA and SCA emanating directly from the dome and neck of the aneurysm (Fig 2-A, B). The Y- stent technique should be a good alternative.

Using the above method, a 300 cm, 0.014 inch microwire was placed into the right P3 segment, and then a 4×30 mm neuroform-3 stent delivery system was advanced over the wire into the proximal portion of right PCA, and then deployed the stent so as to bridge from right P1 segment to BA. However, the proximal portion of the stent jumped into the aneurysm when the microwire was pulling back into the BA. The displaced stent horizontally bestrode the aneurysm from right P1 segment to the ostium of left P1 segment and SCA. No contrast was observed to leak from the aneurismal wall and abciximab was administered intravenously. A microcatheter was advanced into the dome of the aneurysm through the interstices of the stent. The aneurysm was embolized with 12 coils (microvention and cordis) without the coil being herniated into the parent artery (Fig 2-C). The angiogram showed excellent occlusion the lumen of aneurysm and no branch occlusion was seen (Fig 2-D). The patient recovered in good condition.

Patient 2

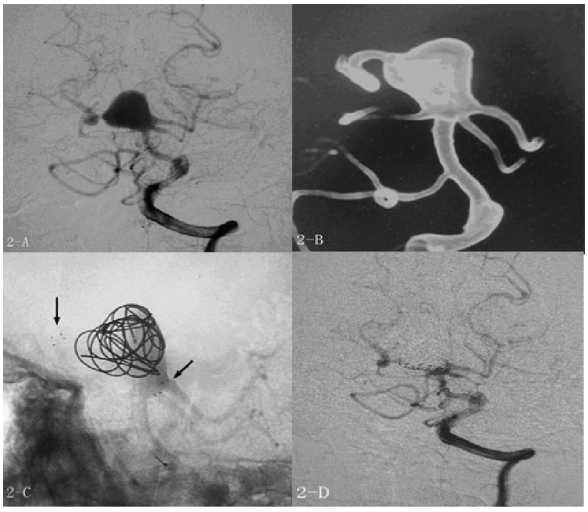

Fig 2-A. The basilar tip aneurysm with wide neck involving the bilateral PCA and SCA; Fig 2-B. 3D reconstruction showed the both P1 segments encroached into the aneurysm neck and SCA emanating directly from the base of the aneurysm; Fig 2-C. The proximal portion of the stent migrated into the aneurysm covered the ostium of the left PCA and SCA; Fig 2-D. After embolization with horizontal stent placement plus coiling, the aneurysm was occluded completely by coils with good flow in end branches;

4. Discussion

One potential complication of the "Y" configuration is stent displacement. Thorell et al described seven patients with wide neck basilar tip aneurysms treated with Y-stent assisted coil embolization. They found insignificant stent displacement occurred in all cases, displacement was always in the cephalad direction pertaining to the BA and laterally within the P1 segment, which did not interfere the effect of Y stent4.

The two cases demonstrated that either the distal or proximal portion of the stent could displace into the aneurysm. It's important to note that both stent displacements occurred during the process of pulling back the microwire from PCA, which is similar to the report of Broadbent et al who described two cases of stent malposition within internal carotid artery large aneurysms5. The manufacturers recommend that the length of neuroform stent should extend 4 mm proximal and distal to the aneurysm neck respectively to achieve reliable stent stability. We consider that the stent may need more "secure length" on condition that the stent bridge artery

bifurcation, which demand enough friction force to stabilize the stent.

When the stent bridging from PCA to BA, it could generate a certain longitudinal rebounding force which probably cause the stent displacement under outside factors, such as microwire, microcatheter or another stent. In the first cases, the length of first stent was 20 mm which exceeded more than 4 mm length on both ends of the aneurysm. When the microwire were pulling back into BA，the distal portion of the stent migrated into the aneurysm. In the second case, the neck of aneurysm was so wide that the proximal portion of the stent had not enough secure length (we used a 30 mm length stent that is the currently maximal length) which generated inadequate frictional force, therefore, the stability of the stent decreased. Under the circumstances, longer length of stent may be an alternative because it can increase the stability of the stent

5. Conclusion

These cases highlight the potential tendency of stent displacement during procedure of Y-stent technique of wide-neck basilar tip aneurysm, the former stent seems to displace more easily than the latter stent, and longer length of stent may reduce the incidence of stent displacement.

06/09/2011

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