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Sequential sidelong balloon remodeling technique in coil embolization of a wide-necked basilar tip aneurysm

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Abstract

The use of balloon remodeling technique for coil embolization has developed into a safe alternative to stent assisted coil embolization for wide-necked aneurysms. Dual antiplatelet therapy when a stent is placed for assistance in the treatment of ruptured aneurysms is of concern. There are cases in which a single balloon seems insufficient to protect from coil herniation, like when two vessels are in the proximity of the side of the aneurysm neck. Techniques using two balloons for remodeling have been described; however, dual vascular access may be required. A case is presented in which a ruptured basilar tip wide-necked aneurysm was treated with a single balloon, using a sequential sidelong balloon remodeling technique. Complete embolization of the aneurysm was achieved maintaining patency of bilateral posterior cerebral arteries.

Case Report

A 50-year-old woman with a history of hypertension and cigarette smoking presented with a ruptured basilar tip wide-necked aneurysm detected by magnetic resonance angiography (Hunt and Hess 1). Cerebral angiogram was performed and demonstrated a basilar tip aneurysm that measured 8 mm × 6 mm with a 4.2 mm neck, sharing bilateral posterior cerebral artery (PCA) origin. It was then decided to perform balloon remodeling coil embolization. A 6 French Neuron guide catheter was placed in the right vertebral artery. A 4 mm × 7 mm hyperform balloon (Micro Therapeutics, Irvine, CA) was placed in the right PCA (Figure 1a). We achieved good visual packing density of the aneurysm on its right side with three coils, Cashmere (Micrus endovascular) 6 mm × 15 cm, Cashmere (Micrus endovascular) 5 mm × 7 cm and a hydrosoft helical (Microvention) 4 mm × 4 cm. However, the left side of the aneurysm still showed some contrast filling. Coil herniation into the left PCA was noted when attempting to embolize the residual aneurysm (Figure 1b). The balloon was removed from the right PCA and placed into the left PCA for remodeling (Figure 1c). The microcatheter was then repositioned on the left residual aneurysm. Difficulty with the catheterization of the left PCA was noted since we had to go around the coil loop with the balloon microwire. Successful coil embolization of the remaining aneurysm was achieved with balloon remodeling. Bilateral PCA origins were preserved (Figure 1d). The herniated coil loop did not stay into the aneurysm with simple balloon inflation; however, the coil mass adopted a new configuration, and the herniated coil loop no longer protruded into the left PCA after three additional coils. Hydrosoft helical (Microvention) 4 mm × 4 cm, hydrosoft helical (Microvention) 4 mm × 8 cm, and a Cashmere (Micrus endovascular) 3 mm × 6 cm were placed with balloon assistance. At that time, the coil mass in the right side did not change its configuration, likely due to good preexisting packing. The patient remained neurologically intact after the procedure.

Discussion

The remodeling technique with hyperform balloon is a feasible, safe, and effective endovascular treatment of wide-necked intracranial aneurysms [1]. The purpose is to cover the neck of the aneurysm to prevent complications from coil herniation into the parent vessel and to increase its packing density. However, if the aneurysm is wide necked and shares the origin of two vessels then a single balloon may be insufficient to protect the entire neck. In such cases, different techniques using two balloons or stents, like “Kissing balloon,” “Y” stent reconstruction, “X” configuration stent, and balloon technique and stent reconstruction have been reported [2–5]. All these endovascular techniques require larger guide support and/or contralateral vessel catheterization. In our

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Figure 1. Cerebral angiography of the posterior circulation following right vertebral artery injection. **a** A basilar tip wide-necked aneurysm (8 mm × 6 mm, 4.2 mm neck) is noted. Hyperform balloon is placed in the right PCA, along the right side of the neck of the aneurysm. There is partial coil embolization of the aneurysm. **b** Increased visual packing density of the aneurysm, a coil loop protruding into the left PCA origin is visualized. The hyperform balloon was withdrawn. **c** Hyperform balloon was placed in the left PCA, along the left side of the neck of the aneurysm. **d** Final cerebral angiography demonstrating aneurysm obliteration and patency of bilateral posterior cerebral artery origin.

patient, we used the balloon remodeling technique in a sequential manner, coiling the right side first with the balloon protecting the right PCA and then proceeding with the left side. Stent-assisted coiling was not considered in our patient since we wanted to avoid dual antiplatelet therapy in the setting of a recently ruptured aneurysm. Although stent assisted coil embolization in ruptured aneurysms is sometimes performed, the safety of this practice is yet to be determined [6].

By using a sequential sidelong balloon remodeling technique, we were able to protect the right side of the neck first and achieve good visual packing density. Once we noted coil herniation into the left PCA, the balloon was

repositioned and inflated to protect the left side of the neck and to retain the coil loop within the aneurysm by placing additional coils. Complications have been reported with the use of balloon remodeling technique mainly thromboembolic [7] but also iatrogenic aneurysm rupture [8]. Nonetheless, those complications do not seem to be higher when compared to primary coil embolization based on a recently published meta-analysis. Apart from dual antiplatelet avoidance, the advantage of balloon remodeling technique may include a lower initial and follow-up aneurysm recanalization rates [1].

Our technique, to our knowledge, has not been previously described as such. It may be helpful in selected cases in which dual access with double balloon remodeling technique is not possible or as a rescue treatment in cases where the neck of the aneurysm is shared with the origin of two vessels, and coil herniation is anticipated.

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