**Case Report**

**A Novel Approach for Transvenous Embolization of Dural Arteriovenous Fistula Using a Balloon and a Coil as Walls: Case Presentation**

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**Background.** Transvenous embolization (TVE) for dural arteriovenous fistula (DAVF) is difficult depending on an accessible route. Reported herein is a case of transvenous embolization using a balloon and a coil as "walls." Case Description. A 56-year-old male patient presented with a 1-month history of mild motor aphasia. The magnetic resonance imaging showed a hemorrhagic lesion in his left temporal lobe, and the cerebral angiography showed a DAVF, with parasinus shunt points near the torcula and the left transverse sinus. Access to the shunt point was very difficult; however, TVE was performed using a balloon as a wall. Furthermore, all lesion embolization was possible using a coil as a wall. Conclusions. Using a balloon or coil as a wall during a TVE is useful.

1. **Introduction**

Transvenous embolization (TVE) is a common treatment for dural arteriovenous fistula (DAVF), but its approach is difficult depending on the access route. Reported herein is a case of DAVF with a shunt point approach, and TVE was performed using a balloon and a coil as "walls."

2. **Case Description**

A 56-year-old male patient, without medical history, presented with a 1-month history of mild motor aphasia. He was able to speak without any problems but sometimes stuck in words. The T2 star-weighted magnetic resonance imaging (MRI) and magnetic resonance angiography of the brain revealed a hemorrhagic lesion in the left temporal lobe (Figure 1(a)) and sinus signal suspected of DAVF (Figure 1(b)).

The cerebral angiography revealed a DAVF, with feeding arteries from the bilateral occipital artery, parasinus shunt points near the torcula and left transverse sinus (TS), drainer of the left TS, occluded partially left TS, and anterograde and retrograde sinus flow of the superior sagittal sinus (SSS) (Figures 2(a)–2(e)). There was no cortical venous reflux; however, there was venous congestion on a venous phase of left internal carotid artery angiography (Figure 2(f)). The Cognard classification was type IIa, and the Borden classification was type I. TVE was planned to prevent rebleeding. However, the angle from SSS to the
Figure 1: (a) T2 star-weighted magnetic resonance imaging revealed a hemorrhagic lesion in his left temporal lobe. (b) Magnetic resonance angiography revealed abnormal sinus signals.

Figure 2: (a–e) Bilateral occipital artery angiography revealed a dural arteriovenous fistula, wherein feeding arteries were bilateral occipital artery, shunt points were a parasinus near the torcula and the left transverse sinus (TS), drainer was a part of the left transverse sinus, left TS was partially occluded, and sinus flow of the superior sagittal sinus (SSS) was anterograde and retrograde. (a) A-P view of right OAG, (b) lateral view of right OAG, (c) A-P view of left OAG, and (d) lateral view of left OAG) (f) Venous phase of left internal carotid artery angiography showed venous congestion without venous cortical reflux. OAG: occipital artery angiography.
drainer was steep; thus, changing to transarterial emboliza-
tion (TAE) was planned if the approach to the drainer is
difficult.

Under local anesthesia, the right femoral artery was
punctured, and a 90 cm 4-French (Fr) FUBUKI (ASAHI
INTECC, Aichi, Japan) was introduced as a guiding
sheath and advanced into the right external carotid artery
for intraoperative angiography and TAE. The right femo-
ral vein was also punctured, and a 25 cm 8-Fr sheath
(Terumo, Tokyo, Japan) was introduced. A 90 cm 8-Fr
Launcher (Medtronic, Minneapolis, MN) was advanced
into the right jugular vein through the sheath. A 113 cm
6-Fr Cerulean DD6 (Medikit, Tokyo, Japan) was used as
a distal access catheter, and an Excelsior SL-10 (Striker,
Kalamazoo, MI) was made to enter the left TS with a
Traxcess (Terumo); however, it was impossible since the
Traxcess bounced to the cranial side of the SSS. There-
fore, a SHOURYU HR 7 mm × 7 mm (Kaneka Medics,
Osaka, Japan) was guided into the SSS, slightly cranial
to the entrance of the left TS and used as a wall. The
balloon was small as a wall in the sinus at normal in-
flation; thus, the balloon was overinflated (Figure 3).
Nevertheless, the SSS was not completely occluded, but
the balloon functioned well as a wall, which allowed the
SL-10 to enter into the left TS with the Traxcess.
Although the SSS was not completely occluded, just in
case, the inflation was done intermittently every 5
minutes. The shunt point was the parasinus near the
torcula and the left TS, but the approach to the parasinus
near the torcula was difficult due to the steep branching;
thus, the parasinus near the left TS was first approached.
The SL-10 was allowed to enter the parasinus near the
TS, and the arterial side beyond the shunt point is easily
reached. First, the parasinus near the left TS was embo-
lized using a total 62 cm coil to return from this part.
Therefore, a wall was created, and the Traxcess and SL-
10 were inverted and easily approached the parasinus
near the torcula using that wall (Figure 4). The shunt
completely disappeared after the embolization using a
total of 149 cm of coil from the shunt point to the exit
of the SSS (Figures 5(a)–5(c)), and venous congestion
has improved a little compared to before the treatment
(Figure 5(d)). Finally, each sheath was removed, hemosta-
sis was performed by manual compression, and the oper-
ation was completed. No complications were observed
after the operation, and his aphasia has almost
disappeared.

3. Discussion

TVE is an established treatment for DAVF, and the
DAVF occlusion rate by TVE was reported as 71%–90%
[1–4]. Many cases of TVE for DAVF, such as cavernous
sinus and isolated sinus, requiring a difficult approach
were reported so far [5, 6]. There are some reports on
catheterization with balloon assist in TAE and aneurysm embolization [7–10]. However, no concrete studies were reported about successful approaches using a balloon as a “wall” for TVE. In our case, overinflated SHOURYU HR of 7 mm × 7 mm was used as a wall due to the unavailability of a larger balloon, such as Copernic RC 8 mm × 80 mm (Balt, Montmorency, France) in Japan. If one balloon is unable to create a large enough wall, placing the two in parallel is possible. The strategy was different from ours, and the balloon was not used to assist the approach; however, Yabuzaki et al. reported a case of DAVF treated using two balloons in the sinus [11]. The duration of complete occlusion of the sinus, including SSS, is unknown, but even with incomplete occlusion as in our case, the balloon can function well as a wall. Therefore, it is not necessary to completely occlude the sinus. There is a report of using a coil mass as an assist in TVE to induce the microcatheter to turn back to the shunting point [12]; however, the use of a coil as a wall is controversial. There is no problem if the route is sufficiently packed with a sufficient amount of coil as in our case, but if the amount of coil is not sufficient, the coil is pushed in, making it dangerous.

4. Conclusions

Approaching the shunt point during TVE is difficult; thus, a balloon or a coil as a wall is useful.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Figure 5: (a–c) The shunt completely disappeared after the embolization from the shunt point near the torcula to the exit of the superior sagittal sinus. ((a) A–P view of X-ray, (b) A–P view of right OAG, and (c) A–P view of left OAG) (d) Venous phase of left internal carotid artery angiography showed a little improvement of venous congestion. OAG: occipital artery angiography.
Conflicts of Interest

The authors declare that they have no conflicts of interest.

References


