
EMBOLIZATION OF A DURAL SINUS FISTULA BY INTRAOPERATIVE INJECTION WITH N-BUTYL CYANO ACRYLATE (NBCA)

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SUMMARY

A patient presented with multiple episodes of intracranial hemorrhage from a dural arterio-venous fistula (DAVF) involving the Rt transverse sinus. The sinus was totally occluded at the sigmoid-jugular junction with narrowing of the left side venous drainage; leading to the venous retrograde flow into the cortical veins. Attempts to transarterial superselective embolization with NBCA were performed. The branches of feeders were only slightly decreased. Transjugular approach could not be done due to the occlusion of both side jugular bulbs. The surgical small craniotomy at Rt transverse sinus was performed to avoid the risks of the sinus exposure. Direct puncture with the technique of guide wire were followed by catheterization deep into the right sigmoid junction for injection of the NBCA. The torcula was firmly compressed to avoid the migration of glue into the contralateral side sinus. The complete cure of the dural fistula and improvement of the clinical manifestation were achieved after the procedure.

CASE REPORT

A 26-year-old man presented with multiple episodes of intraparenchymal hemorrhage at posterior occipital cortex and subarachnoid hemorrhage (Fig. 1 a-b). Each episode caused coma with worsening of the neurological deficits.

Angiographic study revealed multiple enlarged dural feeders from the right external carotid artery (Fig. 2 a) and tentorial branch from the right internal carotid artery. These feeders opened into the DAVF at right transverse sinus with total occlusion of the right sigmoid-jugular junction. The opposite jugular was narrow at the same level (Fig. 3 a-b). Venous drainage of the DAVF was retrogradely filled into the superior sagittal sinus and straight sinus with multiple dilated cortical veins (Fig. 2 b).

Several sessions of superselective transarterial NBCA embolization did not achieve occlusion of the fistula (Fig. 4 a-c). In addition, it could not prevent intracranial hemorrhages with progressive worsening of the neurological symptoms.

Therefore, we have made a decision to perform the intraoperative occlusion with NBCA via direct puncture after surgical small craniotomy. After the outlining of the right transverse sinus was seen; 16 G cathlon needle was used to puncture into the sinus from the most medial part. After that, the 032 Terumo guide wire was inserted and short cut tapering end 4F catheter was followed (Fig. 5). As the tip reached the spontaneous occluded right sigmoid-jugular junction; manual compression to completely control the venous flow at the right side torcula was successful (confirmed by fluoroscopic contrast testing). The total amount of 3.5 ml. pure NBCA was injected to fill the whole right transverse sinus (Fig. 6 a,b). The 4F catheter was rapidly withdrawn before polymerization occurred. The manual control was last within a few minutes. No active bleeding or immediate complications

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were observed. The surgical closure of the craniotomy was done.

Clinical improvement after the procedure was continuously observed and follow up 2 weeks angiogram

was performed which showed the complete closure of the DAVF with improvement of the venous congestion (Fig. 7 a-c).

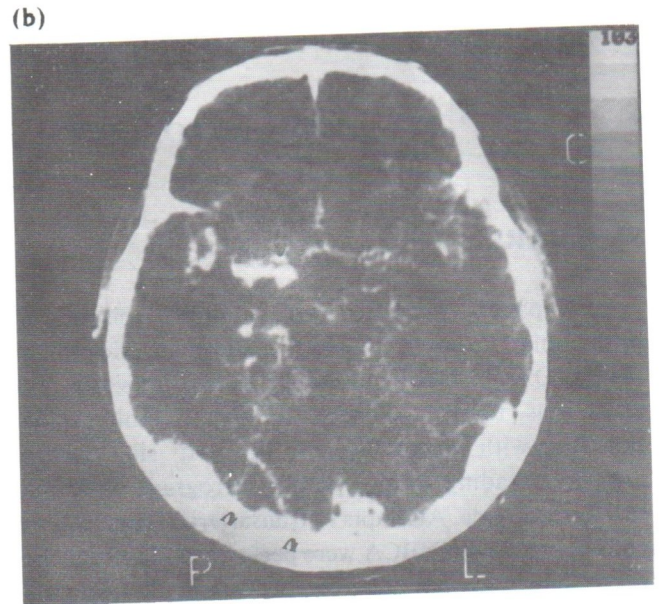
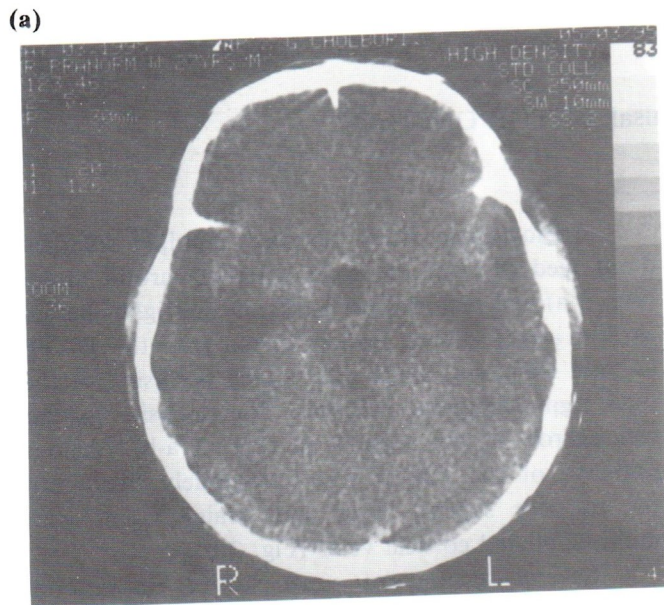


Fig. 1 (a,b) NCCT (a) and CECT (b) showed subarachnoid hemorrhage, hydrocephalus and diffuse abnormal enhanced vessels.

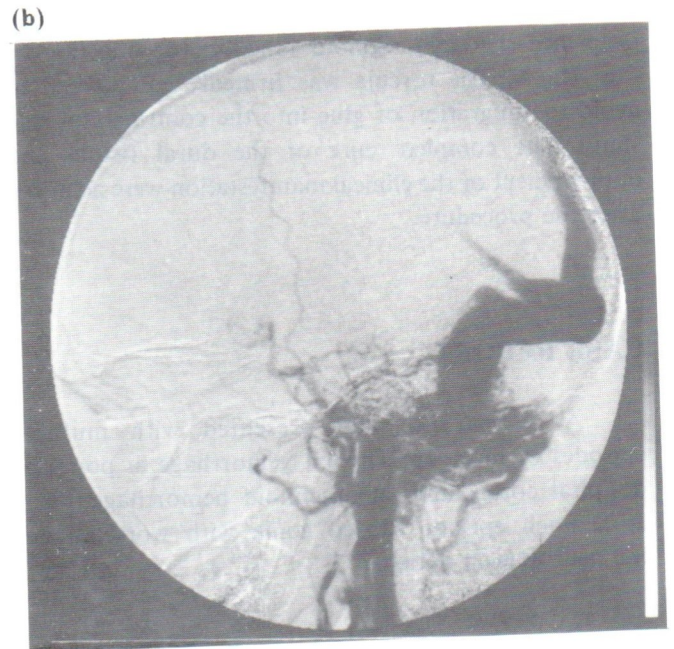
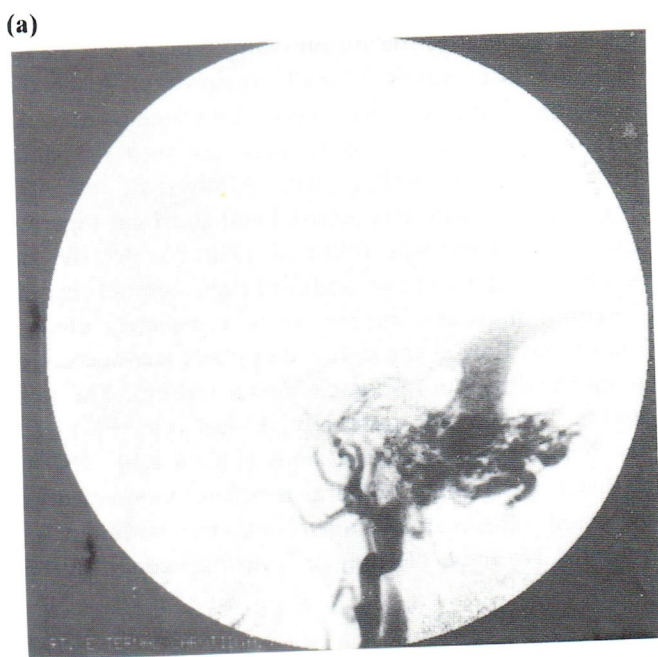


Fig. 2 (a,b) Right external carotid angiogram in lateral view in arterial phase (a), venous phase (b), showed multiple dural feeders opening into the right transverse sinus, narrowing of the jugular bulb and retrograde venous drainage (Djindjian classification type a + b).

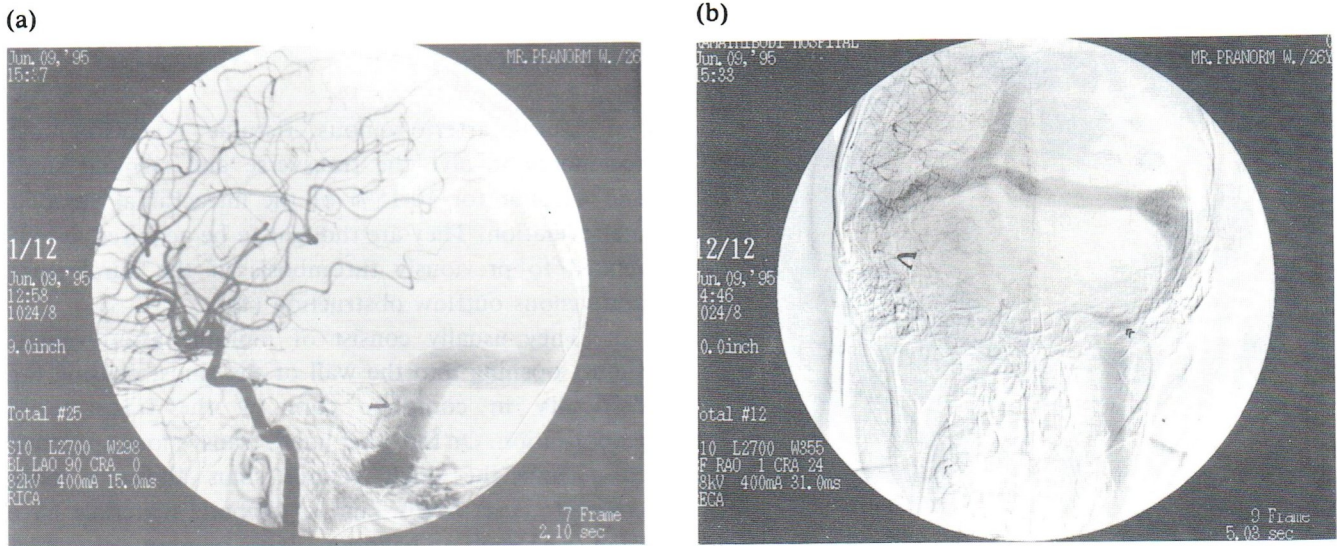


Fig. 3 (a-b) Post transarterial embolization control angiogram, RICA series showed a tentorial branch feeding the DAVF (arrow) (a) and total occlusion of right sigmoid sinus (arrow) with marked narrowing of the left side (arrows) (b).

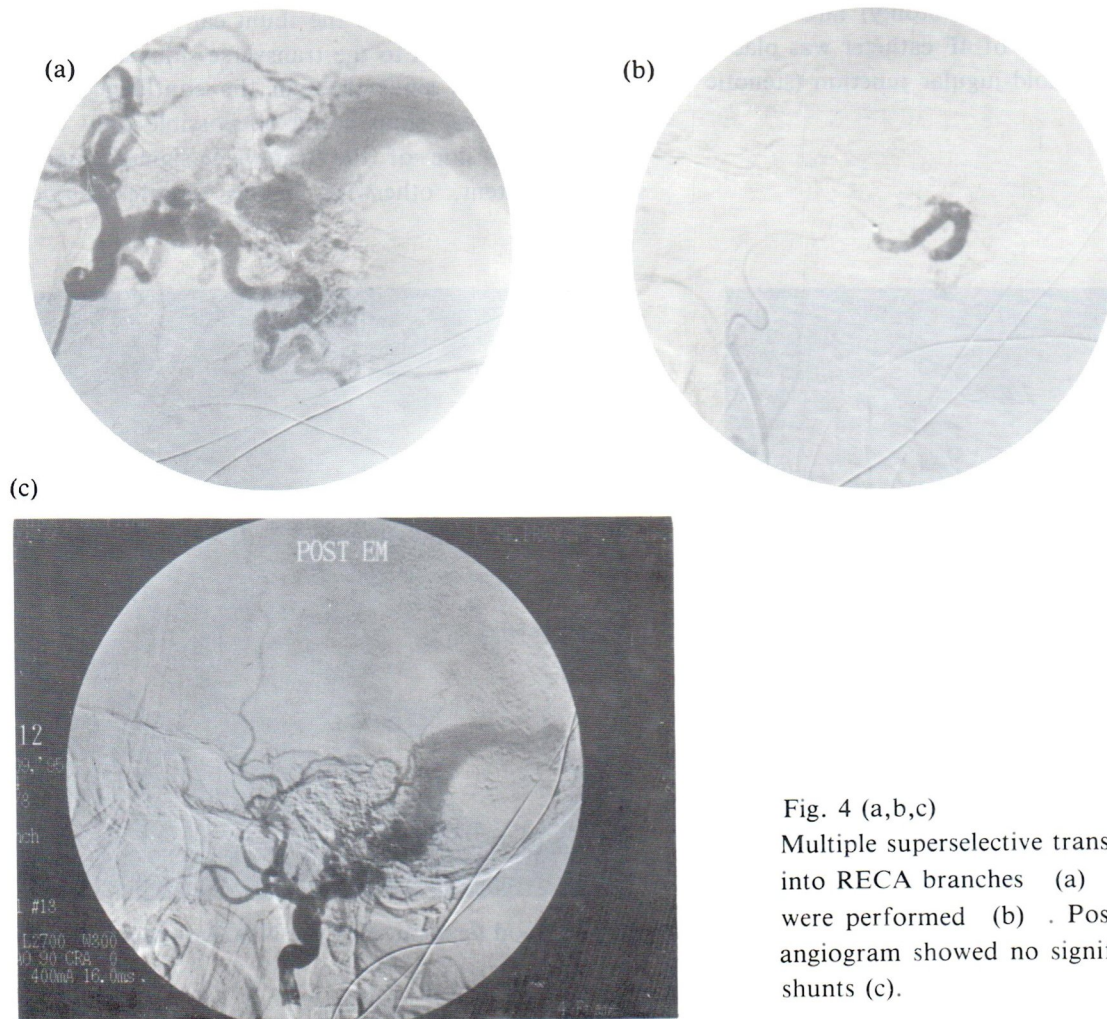


Fig. 4 (a,b,c) Multiple superselective transarterial catheterization into RECA branches (a) with NBCA injection were performed (b). Post embolization control angiogram showed no significant changes of the shunts (c).

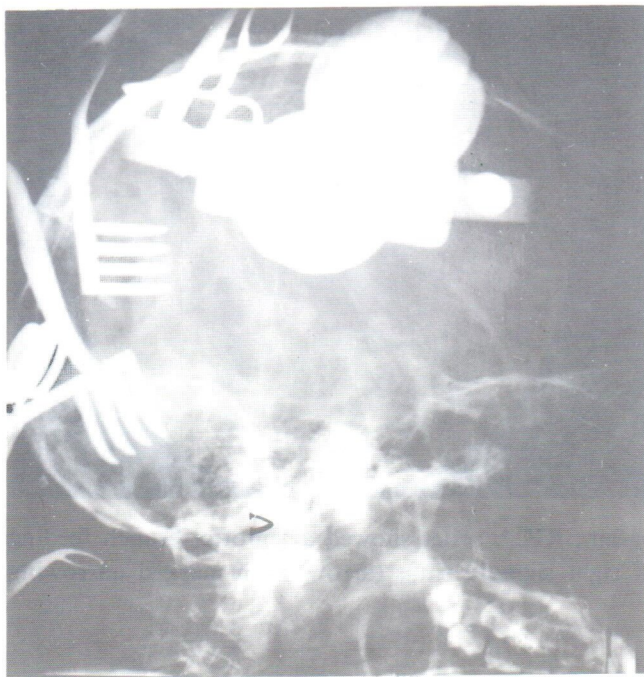


Fig. 5 Intraoperative (small craniotomy) lateral skull film showed the tip of 4F catheter was placed at the right sigmoid-jugular junction (stenotic point; arrow)

DISCUSSION

Dural arterio-venous fistulas (DAVF) most commonly involve the transverse and sigmoid sinus and account for 10-15% of the intracranial vascular malformation. They are thought to be acquired lesions related to previously thrombosis of the dural sinus and venous outflow obstruction (4).

They usually consist of multiple arteriovenous shunts opening into the wall of the sinus; causing the difficulty in complete cure by the transarterial embolization. On the other hand, transvenous approach to occlude the single venous sinus allows a more complete cure. Many kind of embolic materials have been used such as balloons, coils, or even permanent liquid substances (1,2).

There were also some reports on the direct puncture of the enlarge arterial feeders (i.e. occipital arteries) with good results (3). Compression of the occipital artery was claimed to cause clinical cure up to 20% (5). However, when the sinus is occluded, transjugular approach to the shunt can be impossible. Percutaneous access to the transverse sinus by passing the contralateral sinus through the confluence sinus to the thrombose sinus could be possible only when at least one side of the transverse-sigmoid-jugular sinus is patent, otherwise, access requires surgical approach.

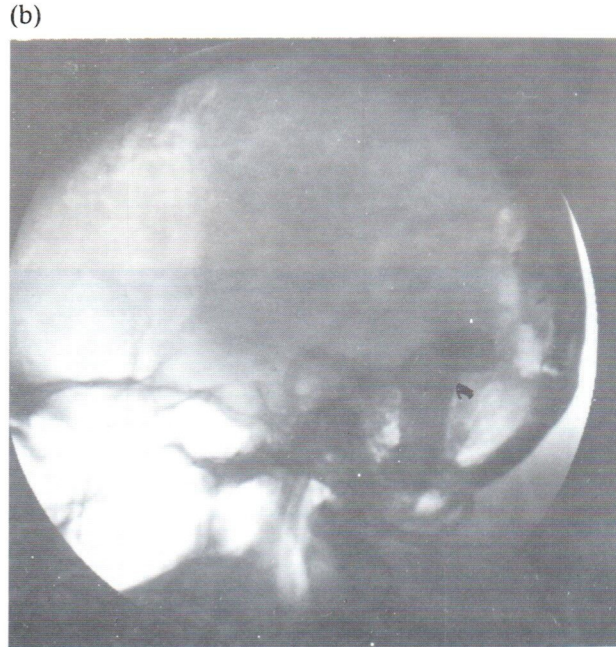
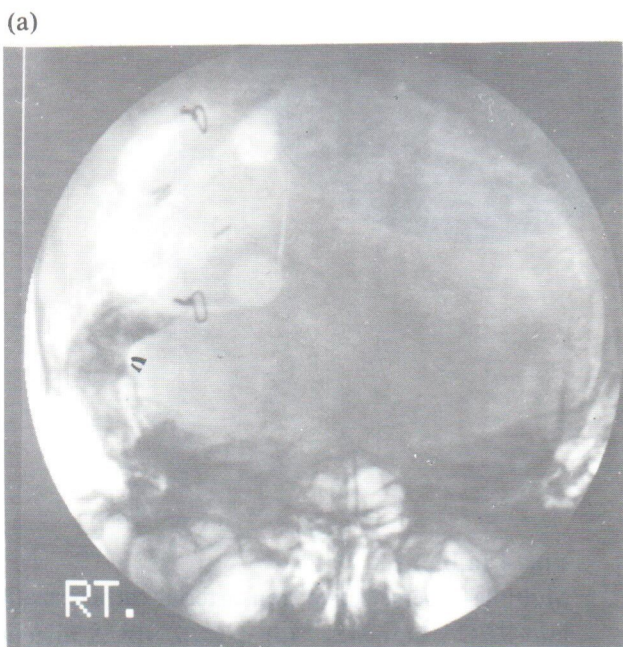


Fig. 6 (a,b) AP and lateral skull film after the procedure showed good deposition of the NBCA (opaque density: arrows) in the whole Right transverse sinus.

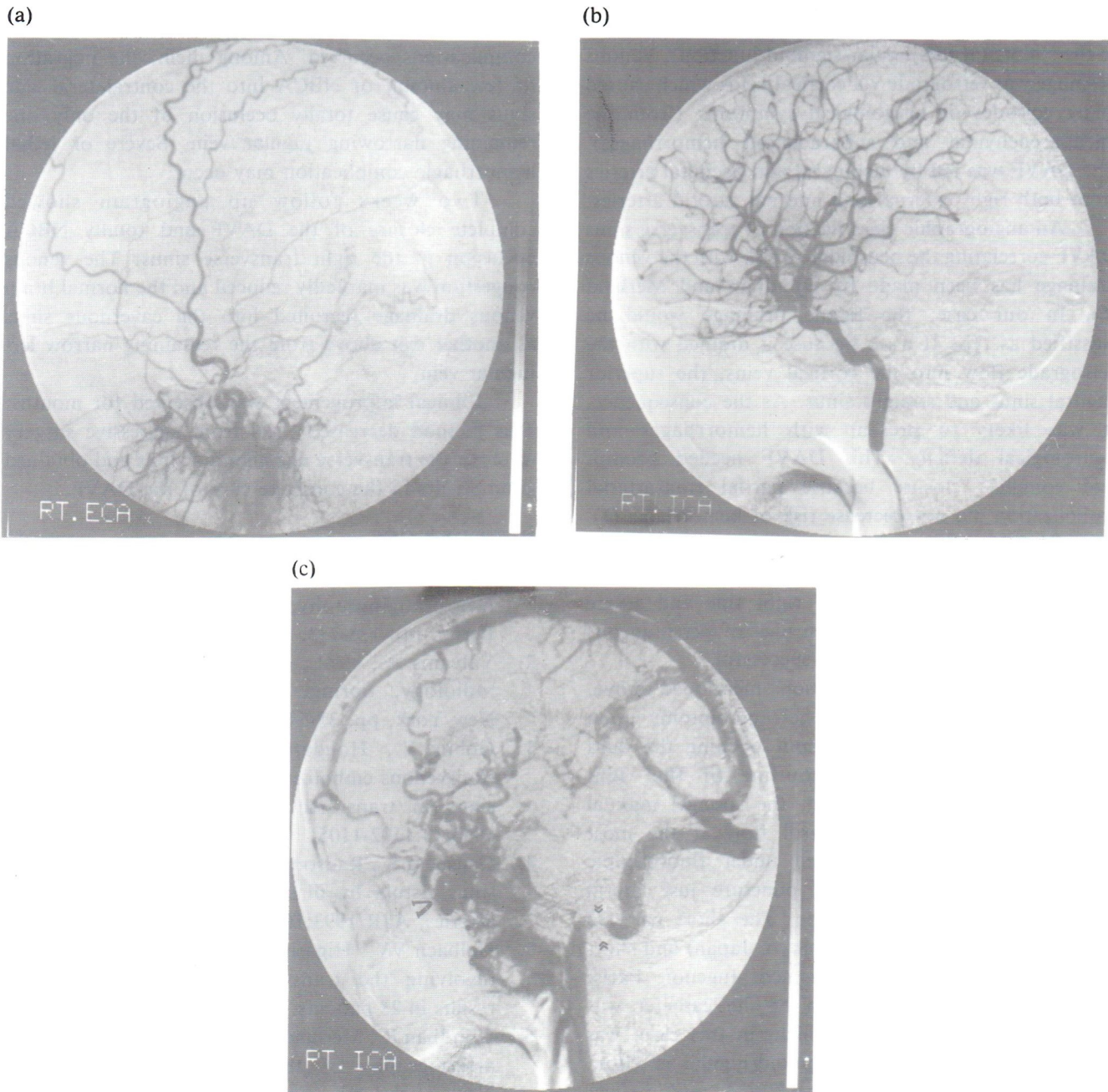


Fig. 7 (a,b,c) Follow up 2 weeks angiogram RECA showed complete closure of the shunts (a); no more tentorial branch of the RICA was observed (b). The visualized transverse sinus (c) was the contralateral side which showed narrowing of the left jugular bulb (double arrow); venous recruited via cavernous sinus (arrow).

In this case, DAVF was located on the right transverse sinus which was totally thrombosed distal to the shunts (at the jugular-sigmoid junction). Venous drainage was retrograde via cortical veins which caused many episodes of neurological symptoms (from the intraparenchymal and subarachnoid hemorrhages). The DAVF was fed by meningeal and occipital arteries from both right external and internal carotid arteries.

An angiographic classification of transverse sinus DAVF correlating the neurological risk with the venous drainage has been made by Djindjian and Merland (6). In our case, the fistula drainage would be classified as type II a+b because it drained with the retrograde flow into the cortical veins, the superior sagittal sinus and straight sinus. As the consequence, it was likely to present with hemorrhages and neurological deficits. This DAVF needed prompt and complete closure because partial transarterial embolization did not decrease risk of hemorrhage (1).

Transvenous approach from femoral vein passing through both jugular bulbs would also be impossible due to the total occlusion of right side and severe narrowing of the left side, even idea of percutaneous jugular puncture would not be successful.

Because of all the restrictions mentioned above, the intraoperative small burr hole craniotomy upon the right transverse sinus without opening the dura was performed. After the outline of the right transverse sinus was visualized, the spongel manual compression in order to control flow at the most medial part could be obtained under fluoroscopic contrast injection test. Direct puncture just lateral to the control point was made. The short cut 032 Terumo guide wire (Terumo, Tokyo, Japan) and short cut tapering 4F catheter (Nycomed, Ingenor, Paris, France) were chosen. The tip of the catheter was placed as distal as possible which, in this case, was at the occlusion of the right sigmoid-jugular junction. About 3.5 ml. of almost pure NBCA mixture was

injected to fill the whole right transverse sinus and the catheter was rapidly pulled out. No immediate complications occurred. Among them, the migration of few amount of NBCA into the contralateral side sinus may cause totally occlusion of the only one remaining narrowing jugular vein. Severe or lethal hemorrhagic complication may occur.

Two weeks follow up angiogram showed complete closure of the DAVF and totally NBCA occlusion in the right transverse sinus. The venous congestion was markedly reduced and the normal brain venous drainage recruited into the cavernous sinus as another exit above from the remaining narrow left jugular vein.

Clinical improvement was observed for months. This method decreased risks from aggressive surgery to resect the transverse and sigmoid sinus and obtained good results in the complete cure of the DAVF.

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