

가
12 T1 T2
3-6mm 37
(fair), (poor) (excellent),
group A(
) group B(
) Cognard

1/3,
1/3
11 (11/12), 1 (1/12), T2
6 (6/12), 4 (4/12), T1
4 (4/12), 6 (6/12) group A 6 (6/12) 5 Cognard
IIa IIb , group B 6 (6/12) 5 Cognard I

T1 가
(1).
가 S 가 T1 T2 가
(2) 가
(3,4).

(3,5-7).
(8-10),

Cognard (11) 가 8 , 가 4 29 67

1.5T (Gyrosan ACS-NT,
Philips, Amsterdam, Netherlands) 0.5T (MRT-50A, Toshiba,
Tokyo, Japan)

(Multi-Star TOP, Siemens, Erlangen, Germany)

T1 (TR/TE 500-600/12-

15) T2 (TR/TE 3000-4000/100-120) 가

T1 (TR/TE 400-

600/15) , 3-6mm (9/12), (9/12), (6/12), (5/12), (5/12), (4/12), (3/12), (3/12)

3 (12/12)

가

가

(Fig. 1-4)

가

1/3

1/3

T1 T2

(Table 1).

T1

가

(3/12)

3

(vascular signal void)

(Fig. 1).

6 (6/12),

, , 3 (:

3 (3/12)

, : 가 , :

) 3가

2 group A(

12

T1

) group B(

11 (11/12),

1

) Cognard (11)

(1/12) , T2

6 (6/12),

Cognard (11)

4 (4/12),

2 (2/12) , T1

4 (4/12),

6 (6/12),

Table 1. Summary of Results in Patients with Dural Arteriovenous Fistula in Cavernous Sinus

Case No.	Age/ Sex	Grading on MRI			Location in Cavernous Sinus	Cavernous Sinus Bulging	Group on MRI	Cognard Type
		T1WI	T2WI	Gd-T1WI				
1	66/F	E	E	E	Axial : posterior Coronal: middle & inferior	-	B	I
2	43/F	F	F	E	Axial : posterior Coronal: middle & inferior	-	B	I
3	67/M	E	F	E	Axial : middle & posterior Coronal: whole	+	B	I
4	64/M	F	E	E	Axial : posterior Coronal: inferior	-	B	I
5	29/M	F	P	E	Axial : middle & posterior Coronal: middle & inferior	+	B	IIa
6	56/F	F	E	E	Axial : posterior Coronal: inferior	-	A	I
7	63/F	P	F	F	Axial : middle & posterior Coronal: no visible	-	A	IIa
8	51/F	P	P	E	Axial : whole Coronal: whole	+	A	IIa
9	46/M	E	E	E	Axial : middle & posterior Coronal: whole	+	A	IIa
10	52/F	E	E	E	Axial : middle & posterior Coronal: whole	+	A	IIb
11	56/F	F	E	E	Axial : posterior Coronal: middle & inferior	-	B	I
12	50/F	F	F	E	Axial : middle & posterior Coronal: whole	+	A	IIa

Grading on MRI : Grade on detection of vascular signal voids in cavernous sinus, E= excellent , F= fair, P= poor

Group on MRI : A(The size of the lesions in cavernous sinus was equal or larger than that of cavernous internal carotid artery) and B(these were smaller than cavernous internal carotid artery)

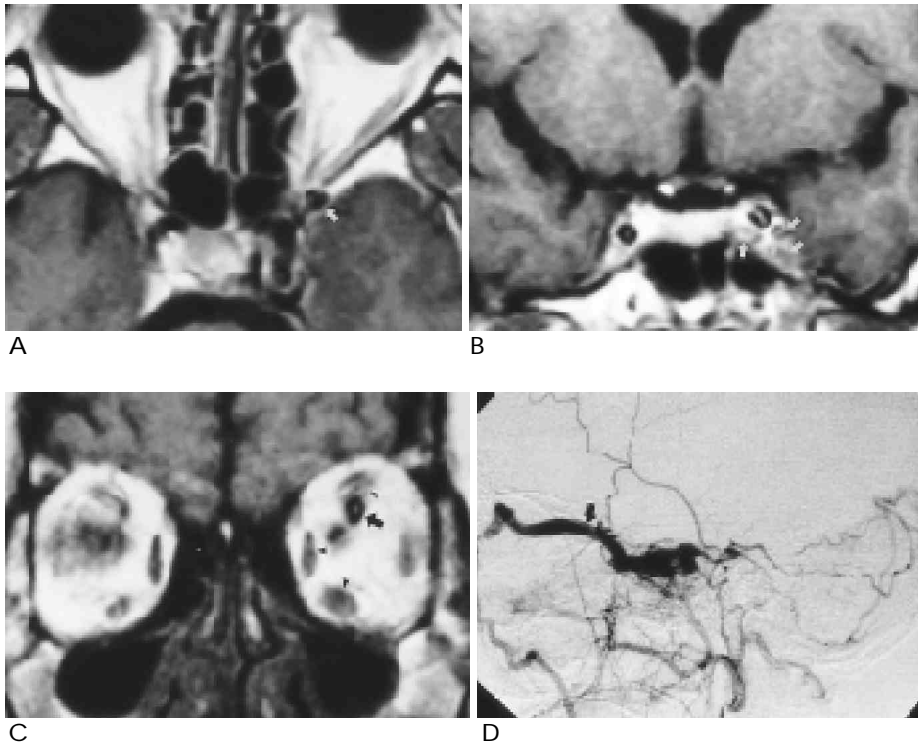


Fig. 1. A 51-year-old woman with diplopia, ocular pain and 6th nerve palsy in left eye (MRI-group A, Cognard type IIa).

A,B. Gadolinium-enhanced T1-weighted axial(A) and coronal(B) images show well visualized multiple irregular low signals within left cavernous sinus(arrows). The diameter of abnormal signal voids is equal to that of left cavernous internal carotid artery. Note mild bulging of the lateral wall of left cavernous sinus and superior displacement of left internal carotid artery. T1- and T2- weighted images did not demonstrate signal voids in cavernous sinus(not shown).

C. T1-weighted coronal image shows signal void of dilated left superior ophthalmic vein(arrow) and thickened extraocular muscles in left orbit(arrowheads).

D. Lateral view of left external carotid arteriogram demonstrates dural arteriovenous fistula with retrograde filling of left superior ophthalmic vein(arrow).

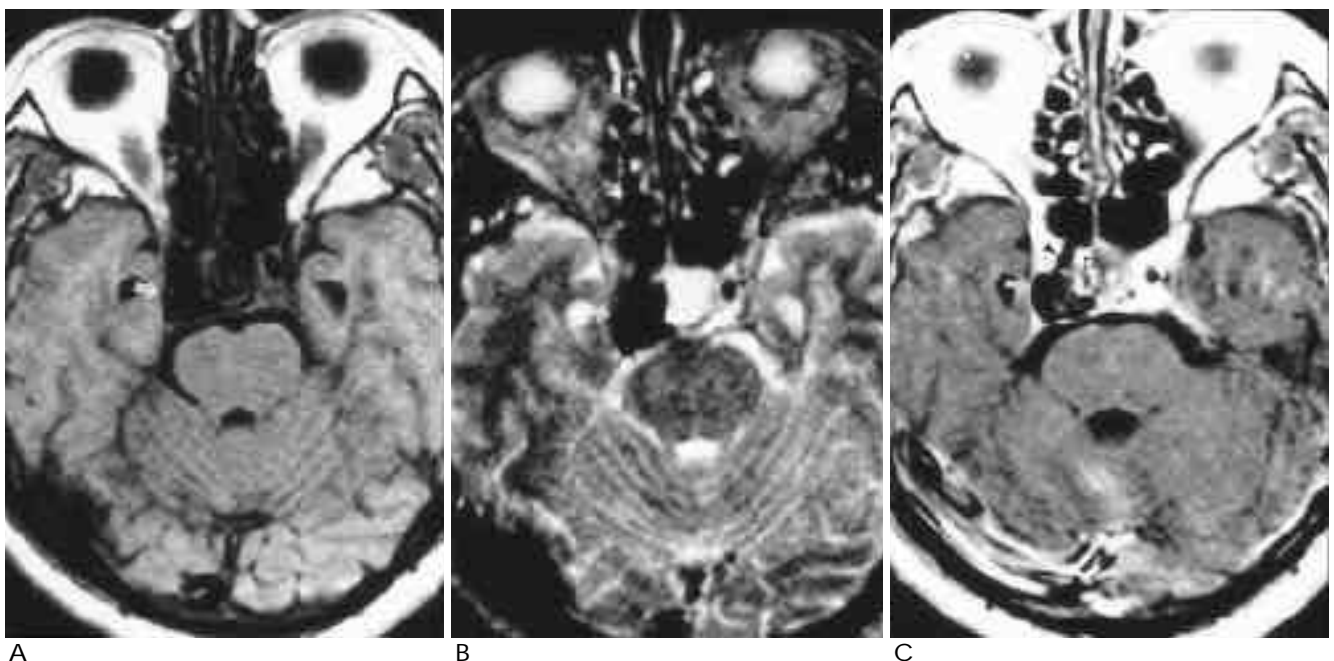


Fig. 2. A 52-year-old woman with 6th nerve palsy, chemosis and diplopia of right eye (MRI-group A, Cognard type IIb).

A-C. Axial T1-(A), T2-(B) and Gd-enhanced T1-weighted(C) images show abnormal large signal void in right cavernous sinus(closed arrows), which looks similar to aneurysm. This abnormal large signal void, mimicking the aneurysmal sac, is larger than that of cavernous internal carotid artery. The linear low signal(open arrow) is visible around large sac of signal void, which may favor the diagnosis of dural arteriovenous fistula. Note mild bulging of lateral wall of right cavernous sinus and displaced right internal carotid artery(arrowhead). Both internal and external carotid arteriogram demonstrated dural arteriovenous fistula in right cavernous sinus. The shunted blood was drained into cortical vein and both inferior petrosal sinuses(not shown).

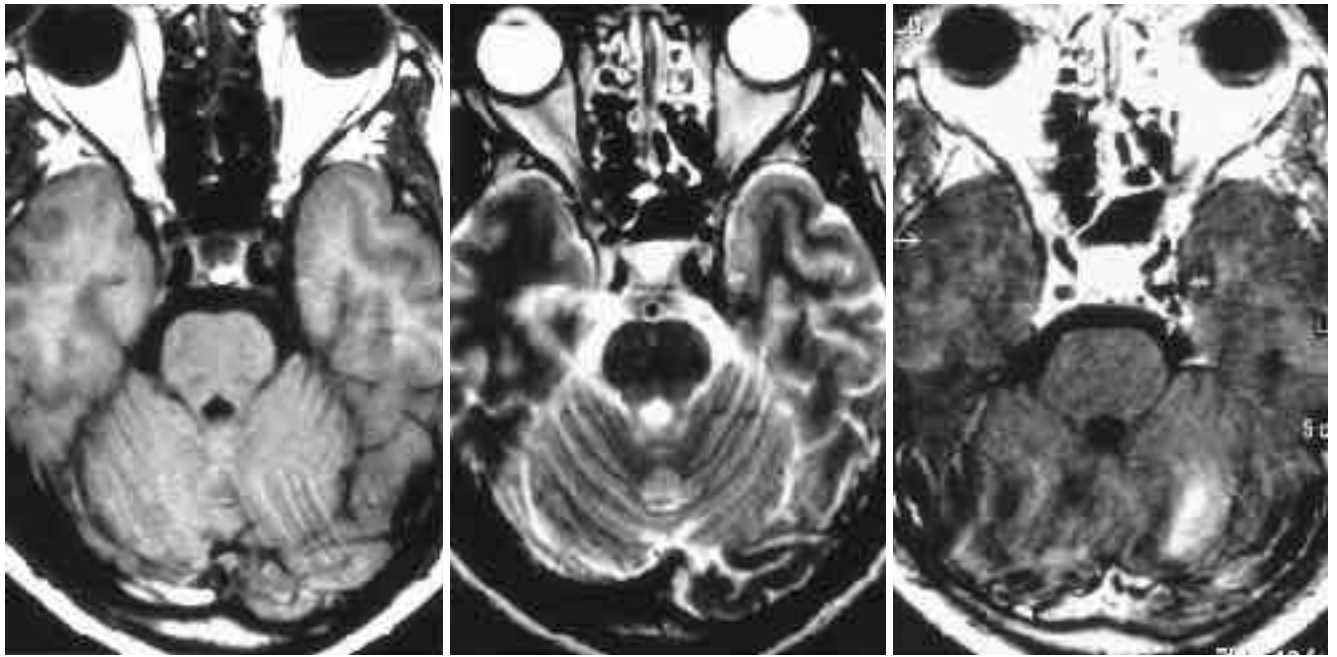


Fig. 3. A 43-year-old woman with ocular pain and visual disturbance in left eye (MRI-group B, Cognard type I). A-C. Axial T1-(A), T2-(B) and Gd-enhanced T1-weighted(C) images show multiple irregular signal voids just lateral to internal carotid artery in posterior 1/3 of left cavernous sinus(arrows). The signal voids are much conspicuous on C. The diameter of signal voids is smaller than that of left cavernous internal carotid artery. Both internal and left external carotid arteriogram demonstrated dural arteriovenous fistula in left cavernous sinus, which was drained into inferior petrosal sinus(not shown).

2 (2/12) . 가 S
(2),
2 group A 12 6 (6/12) , 가 (3)
Cognard IIa IIb 가 5 . group A 68%, (4) 72%
가 4 , 가 2
(sac) (inferolateral trunk,
가 2 meningohypophyseal trunk) (artery of
(Fig. 2). group B 6 (6/12) , foramen rotundum, middle meningeal artery, accessory meningeal
5 Cognard I (Fig. 3, 4) Cognard IIa artery, ascending pharyngeal artery)가
(5).
가
, 3
2가
(carotid- 가
cavernous fistula) 가
(5). (inter-
cavernous sinus)
10-15% (14). 가
(12), 40-60 (3,5-7). 가
(9). 가
가 (13).

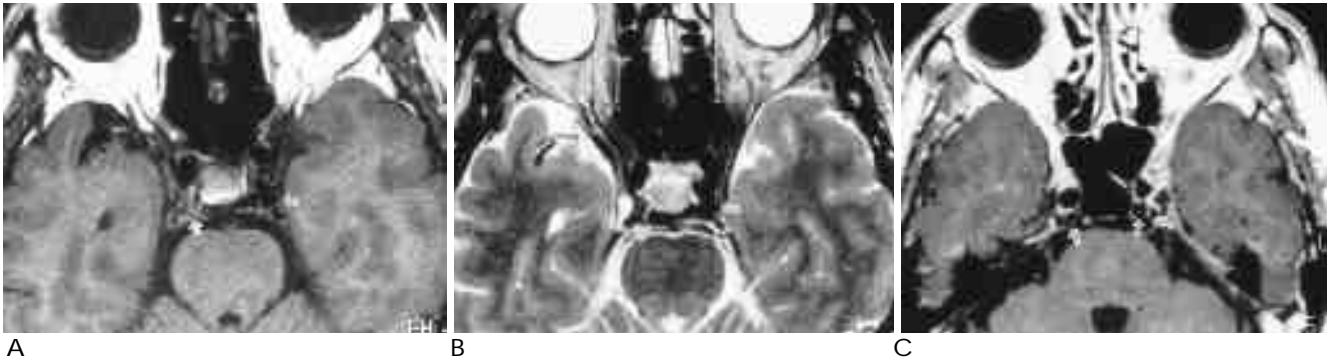


Fig. 4. A 67-year-old man with diplopia, ocular pain, 6th nerve palsy and visual disturbance (MRI-group B, Cognard type I). A-C. Axial T1-(A), T2-(B) and enhanced T1-weighted(C) images show multiple tortuous signal voids(arrows) in posterior and middle 1/3 portion of both cavernous sinuses(T1: excellent grade, T2: fair grade, enhanced T1: excellent grade). The diameter of signal voids is smaller than that of cavernous internal carotid artery. Both internal and external carotid arteriogram demonstrated dural arteriovenous fistula in both cavernous sinuses, which was drained into inferior petrosal sinus(not shown).

가 Machida (15)

(10) , (bruit) , (3,4,5,6)

(4). (3) 가 가 2 .

8 가 가

6 3

가 . Cognard IIa 6 (6/12)

Barrow (5)

가 T1 T2 group A가 group B Cognard group A가

T1 group A가 group B

(screen- 가

ing) (10), (8) 83%(5/6) 1/3 T1

1/3 가

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MR Findings of Dural Arteriovenous Fistula in Cavernous Sinus¹

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Purpose : To evaluate the MR findings of dural arteriovenous fistula(DAVF) in the cavernous sinus and to determine the most useful imaging method for the diagnosis of DAVF.

Materials and Methods : We evaluated the MR findings of 12 patients in whom DAVF was diagnosed in the cavernous sinus on the basis of angiographic findings. Axial T1- and T2-weighted, and axial and coronal Gd-enhanced T1-weighted images with 3-6mm slice thickness had been obtained, and the findings of DAVF on three pulse sequences were examined and compared. On the basis of the detection of DAVF on three pulse sequences, the MR findings were graded as excellent, fair or poor, and the location of DAVF in the cavernous sinus was analysed. We also classified DAVFs as group A or B on the basis of MR findings (group A: lesions in the cavernous sinus were as large as or larger than the cavernous internal carotid artery; group B: these were smaller than the cavernous internal carotid artery) and compared with cognard type on angiogram.

Results : Multiple tortuous signal voids were found in all DAVFs. The signal voids were located mainly in the middle and posterior one third of the cavernous sinus, as seen on axial images, and the middle and inferior one third, as seen on coronal images. Axial and coronal enhanced T1-weighted images showed an excellent grade in 11 of 12 cases and a fair grade in 1 of 12. Axial T2-weighted images showed an excellent grade in 6 of 12 cases and a fair grade in 4 of 12. T1-weighted images showed an excellent grade in 4 of 12 cases and a fair grade in 6 of 12. Six cases were group A, and 5 of the 6 were Cognard type IIa or IIb; The other 6 cases were group B, 5 of the 6 were Cognard type I.

Conclusion : MR findings of multiple tortuous signal voids in the cavernous sinus, especially in the posterior or inferior portion, suggest DAVF, and enhanced T1-weighted imaging could be the most useful sequence for its diagnosis.

Index words : Cavernous sinus, MR
Fistula, arteriovenous

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