Fistules Durales Arterioveineuses
Imagerie et Traitement

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Dural Arteriovenous Fistula

Diagnostic Imaging

- CT and TC-Angio
- MR and MR-Angio
- Digital Angiography

The choice depends on the quality of the equipment available.

OBJECTIVE
Correct and fast Diagnostic with less risk

Treatment

19emes JAFRIM – Alger, avril, 2019
Dural Arteriovenous Fistula

• 24 dural fistula
• 6 signs
  • Assimetry of dural sinus density (92%)
  • Dilatation of arteries (79%)
  • Transosseous vessels (79%)
  • Extracranial dilated veins (54%)
  • Dilated cortical veins (29%)
  • Venous Thrombosis (17%)
• At least 2 positive signs
• Concordance with DSA interobservador:
  • 100% in cavernous sinus, clival and hypoglossal regions, superior long sinus
  • 78-89% lateral sinus
Dural Arteriovenous Fistula

MR Angiography of Dural Arteriovenous Fistulas: Diagnosis and Follow-Up after Treatment Using a Time-Resolved 3D Contrast-Enhanced Technique

BACKGROUND AND PURPOSE: Digital subtraction angiography (DSA) is the method of reference for imaging of dural arteriovenous fistula (DAVF). The goal of this study was to analyze the value of different MR images including 3D contrast-enhanced MR angiography (MRA) with a high temporal resolution in diagnostic and follow-up imaging of DAVFs.

MATERIALS AND METHODS: A total of 18 MRMRA examinations from 14 patients with untreated (n = 9) and/or treated (n = 9) DAVFs were evaluated. Two observers assessed all MR and MRA investigations for signs indicating the presence of a DAVF, for fistula characteristics such as fistula grading, location of fistulous point, and fistula obliteration after treatment. All results were compared with DSA findings.

RESULTS: On time-resolved 3D contrast-enhanced (TR 3D) MRA, the side and presence of all patent fistulas (n = 13) were correctly indicated, and no false-positive findings were observed in occluded DAVFs (n = 5). Grading of fistulas with this imaging technique was correct in 77% and 86% of patent fistulas for both readers, respectively. On T2-weighted images, signs indicative of a DAVF were encountered only in fistulas with cortical venous reflux (56%), whereas on 3D time-of-flight (TOF) MRA, most fistulas (88%) were correctly detected. In complete fistula occlusion, false-positive findings were encountered on both T2-weighted images and on TOF MRA images.

CONCLUSION: In this study, TR 3D MRA proved reliable in detecting DAVFs and suitable for follow-up imaging. The technique allowed—within limitations—to grade DAVFs. Although 3D TOF MRA can depict signs of DAVFs, its value for follow-up imaging is limited.

Cranial Dural Arteriovenous Fistula: Diagnosis and Classification with Time-Resolved MR Angiography at 3T

BACKGROUND AND PURPOSE: The diagnosis of dural arteriovenous fistula (DAVF) remains one of the few uncontested indications for catheter-based cerebral angiography. We report our experience of using a commercially available form of time-resolved MR angiography (tMRA) at 3T for the diagnosis and classification of a cranial DAVF compared with the reference standard of digital subtraction angiography (DSA).

MATERIALS AND METHODS: A retrospective review of our patient records identified patients who had undergone tMRA at 3T and DSA for the evaluation of DAVF. The tMRA consisted of whole-head, contrast-enhanced “time-resolved imaging of contrast kinetics” (TRICKS) MRA. Image sets were independently reviewed by 3 readers for the presence, location, and classification of a DAVF. The reported result of the DSA was used as the gold standard against which the performance of the tMRA was measured.

RESULTS: Forty patients were identified who had undergone DSA and tMRA for evaluation of DAVF, yielding a total of 42 cases. On DSA, the results of 7 cases were normal, 15 cases were performed for surveillance of a previously cured fistula, and a new fistula (14) or persistent (8) fistula was found in 20 cases. Of these 20 fistulas, on DSA, 13 were Borden I, 2 were Borden II, and 5 were Borden III. In 93% (32/34) of DAVF cases, the 3 readers were unanimous and correct in their independent interpretation of the tMRA, correctly identifying (or excluding) all fistulas and accurately classifying them when encountered.

CONCLUSIONS: In this small series, tMRA at 3T seems to be a reliable technique in the screening and surveillance of DAVF in specific clinical situations.
Dural Arteriovenous Fistula

• Abnormal vascular shunts between arteries and veins within the leaflets of dura-mater

• Aetiology remains unknown, acquired lesions triggered by intrinsic and extrinsic factors, female predisposition, older patients

• 10-15% of intracranial arteriovenous malformations
Clinical Features

( Depends of the type of venous drainage)

Assinptomatic  ————  Hemorrhage

- Pulsatile Tinnitus, Bruit
- Exophtalmus, Chemosis
- Visual Impairment
- Headaches
- Vomits
- Cranial nerves palsy
- TIA, stroke
- Seizures
- Dementia
Dural Arteriovenous Fistula Location

- Transverse sinus and sigmoid (60%)
- Cavernous Sinus (12%)
- Tentorium (4-5 %)
- Superior longitudinal sinus, torcula (5%)
- Anterior and media cranial fossa (5%)
- Foramen occipital and jugular (<5%)
Classification according to Venous Drainage
DJINDJIAN  1975

I  Drenagem para seio ou veia meningea
II  I + refluxo para veia cortical
III  Drenagem directa para veia cortical
IV  Drenagem para ectasia dural

CLINICAL RISK
Classification according to Venous Drainage
MERLAND and COGNARD 1995

I  Direct drainage to dural sinus with anterograde flow

II  Drainage to sinus with reflux
    a  to a sinus
    b  to cortical veins
    a+b  to sinus and cortical veins

III  Venous drainage directly to cortical veins

IV  Venous drainage directly to cortical veins with venous ectasia

V  Intracranial DAVF with venous drainage to spinal perimedullary veins
Hemorrhagic Risk / Location
Cognard et al

- Tentorial (92-97%)
- Cranial Anterior Fossa (68-88%)
- Superior Longitudinal Sinus (50-65%)
Dural Arteriovenous Fistula – neurological risk

RELATED TO CLINICAL RISK

Without Neurologic risk
- Type I and II A
- DAVFs WITHOUT Cortical venous drainage
  - Treat the symptoms

With Neurologic risk
- Type II B, Type II A+B, Type III, Type IV and V
- DAVFs WITH Cortical Venous Drainage
  - Treat the risk
Dural Arteriovenous Fistula – neurological risk

**RELATED TO CLINICAL RISK**

- **Without Neurologic risk**
  - Type I e II A
  - DAVFs WITHOUT Cortical venous drainage
  - Treat the symptoms

- **With Neurologic risk**
  - Type II B, Type II A+B, Type III, Type IV e V
  - DAVFs WITH Cortical Venous Drainage
  - Treat the risk

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TREATMENT

Need to reestablish the normal pressure gradient
No need to reestablish the normal anatomy

Analyse the potentially existing arterial anastomosis before using liquid embolic agents

Analyse the venous drainage from the fistula and from the brain in the perspective of occluding the venous drainage

DIGITAL ANGIOGRAPHY
TREATMENT

- THE BEST WAY TO REACH THE ‘FOOT’ OF THE VEIN
  - ENDOVASCULAR
  - SURGERY

VENOUS APPROACH

ARTERIAL APPROACH

DEPENDS OF THE ANGIOARCHITECTURE OF THE FISTULA

AND

EMBOLIC AGENT
ONYX, SQUID, PHIL

Changed the way to treat some dural fistula

Venous Approach

Arterial Approach

COILS

Microcatheteres with compatible Ballons

- Arterial protection
- Better penetration/avoid reflux

Other Techniques:
- ‘cook pressure’,…

GLUE
83 y woman
Progressive hyperemia + chemosis
+ Proptosis with 1 month
27 y, woman
Seizures, left hemiparesis, cognitive impairment. Cranial Trauma in childhood
Type II A+B
48 y, woman, cranial trauma in the past. Vertigo and pulsatile tinnitus
Pre treatment

Post treatment

Type IIA

Squid
41 y, MAN
LEFT TRIGEMINAL NEURALGIA
Type III
68 y, man, onset seizures and ‘stroke mimic’
Type III
64 y, man, 5 days with vertigo and headaches
Type IV
60 y, woman

- Lytic lesion vault right occipital
- Dementia

Tipo IV
Direct Puncture

Before new liquid embolic era
Progressive Paraparesia in 1 month
evolution in 8 days to Tetraplegia
some difficult to swallow and
disartria
Type V