Direct cerebral arteriovenous fistula. Endovascular treatment

Poster No.: C-2171
Congress: ECR 2013
Type: Scientific Exhibit
Authors: P. Vega Valdes¹, E. Murias Quintana¹, A. Alvarez Vazquez¹, C. Pereira Menéndez¹, N. Fernandez Garcia¹, A. Gil Garcia²; ¹Oviedo/ES, ²Madrid/ES
Keywords: Neuroradiology brain
DOI: 10.1594/ecr2013/C-2171
Purpose

Direct communications between an artery and a neighbouring vein are uncommon lesions and have variable aetiology, although they most commonly occur after a traumatic event.

The symptoms depend on the location and tend to be caused by raised intracranial pressure or the intracranial mass effect.

Endovascular treatment is the choice therapy and different options exist:

1. Closure of the artery with the fistula.
2. Detachable balloon inflation to close the anomalous communication.
3. Embolisation of the venous end from the artery or the vein.
4. Covered stent implantation to cover the arterial opening.

Our aim is to show our experience in the diagnosis and treatment of arteriovenous fistulas, placing particular emphasis on the effectiveness of the endovascular technique.
Methods and Materials

Retrospective analysis of patients with arteriovenous fistulas receiving endovascular treatment in Hospital Central de Asturias from 2005 to the present day.
Results

Four patients were treated, three with carotid-cavernous fistulas, and one with a fistula from the vertebral artery to the neighbouring veins.

CAROTID-CAVERNOUS FISTULAS:

CASE 1: a 65 year old female with progressive underlying collagenosis without trauma prior to exophthalmos and chemosis of the left eye.

A CT, a CT angiogram and an MR angiogram were carried out in which a high flow carotid cavernous fistula was observed on the left side.

The cerebral arteriogram indicated that it was a fistula caused by the cerebral aneurysm rupture. (image 1).

The endovascular treatment was undertaken by introducing a microcatheter into the aneurysm from the artery, and coils were introduced with the assistance of the inflation of the balloon in the artery to prevent the release of the coils. (2)

The fistula was closed completely without complications and significant improvement in ocular symptoms was achieved without a loss of visual acuity. (3)

CASE 2: A 45 year old female who presented sudden onset exophthalmos and chemosis in the left eye after severe trauma suffered through a traffic accident.

A CT, a CT angiogram and arteriogram were carried out in which a carotid cavernous fistula was observed on the left side. (4)

The endovascular treatment was undertaken by introducing a microcatheter into the cavernous sinus through the communication. Using a balloon in the artery, coils were introduced in the venous end, but it wasn't possible to completely close the fistula. (5)

The treatment was completed by accessing the permeable venous compartment via the venous pathway. Onyx high density was introduced. (6)

A complete closure of the fistula was achieved. (7)

A significant improvement in ocular symptoms was achieved without a loss of visual acuity.

CASE 3: An 80 year old female who presented exophthalmos, chemosis and a significant loss of visual acuity in the right eye after suffering mild head trauma.
A CT, CT angiogram and arteriogram were carried out in which a carotid cavernous fistula was observed on the right side. (8)

The endovascular treatment was undertaken by introducing a microcatheter into the cavernous sinus through the communication. Using a balloon in the artery, coils were introduced in the venous end, but it wasn't possible to completely close the fistula. It was not easy to access the vein, so two covered stents were implanted into the internal carotid artery, covering the communication. (9)

A complete closure of the fistula was achieved. (10)

A significant improvement in ocular symptoms was achieved, but visual acuity was not recovered.

**VERTEBRAL ARTERIAL FISTULA:**

**CASE 4:** A 20 year old male who presented a feeling of a mass effect in the right cervical region, with associated pain and muscle contracture, one month after a trauma caused through a traffic accident.

An ultrasound, a CT angiogram (11), an MR angiogram (12) and cervical arteriograms were carried out.

A non-prominent right vertebral artery with dissection in its wall was observed, with a pseudoaneurysm where it passes through the C2-C3 intervertebral space with an associated fistula to the neighbouring veins. (13)

The distal vertebral artery and the intracranial circulation filled from the contralateral vertebral artery. (14)

Based on these findings, arterial reconstruction was discounted and an endovascular closure of the injured artery was carried out from the top (from the contralateral vertebral artery) and from below the fistula. (15)

A complete closure of the fistula was achieved. (16)

The patient made satisfactory clinical progress.

In all cases, monitoring by arteriogram was carried out after 6 months, in which the stability of the treatment was displayed.
During the early arterial phase, the internal carotid artery (blue), the cavernous sinuses (red), the superior ophthalmic veins (green) and the cerebral veins (yellow) were filled.

Fig. 1

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
A microcatheter (yellow arrow) inside the aneurysm (red), an inflated balloon inside the internal carotid artery (orange) and coils inside the aneurysm (yellow)

Fig. 2

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 3

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Bone fractures (blue), exophthalmos (red), internal carotid artery (orange), the communication (yellow) and dilated superior ophthalmic vein (green)

Fig. 4

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Inflated balloon in the internal carotid artery (yellow) and coils in the cavernous sinus (red). Despite tightly packed coils, an early filling of the venous side of the fistula continued to occur.

Fig. 5

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
CAVERNOUS SINUS EMBOLISATION WITH ONYX
(from the vein)

Guide catheter in the facial vein (blue), microcatheter in the superior ophthalmic vein (yellow) and onyx in the cavernous sinus (red)

Fig. 6

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 7

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
During the early arterial phase, the internal carotid artery (blue), the cavernous sinuses (red), the upper ophthalmic veins (yellow) were filled.

**Fig. 8**

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Unsuccessful Cavernous Sinus Embolisation with Coils

Covered Stent Implants

Coils in the cavernous sinus (yellow), closed balloon-expandable stent (blue), inflation of the balloon to implant stent 1 (red), stent 1 (orange), inflation of the balloon to implant stent 2 (green)

Fig. 9

© Radiodagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 10

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Pseudoaneurysm (small yellow arrow), partially thrombosed (yellow arrow heads) in the right vertebral artery and the intimal flap (large yellow arrow) in the vertebral artery

**Fig. 11**

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 12

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 13

Vertebral artery (red), pseudoaneurysm (yellow) and visible neighbouring veins in the early arterial phase (small yellow arrows)

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 14

Vertebral artery (red), pseudoaneurysm (yellow) and visible neighbouring veins in the early arterial phase (small yellow arrows)

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 15

Prominent left vertebral artery with good compensation with the intracranial circulation

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Coils within the vertebral artery, below (yellow) and above (red) the fistula

Fig. 16

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Fig. 17

© Radiodiagnostico, Hospital Central de Asturias - Oviedo/ES
Conclusion

Direct arteriovenous fistulas are uncommon.

We have achieved good results in our hospital using different endovascular techniques that were adapted to each patient's characteristics.
References

a