

PARTICULARITIES OF THE IMAGISTIC DIAGNOSIS OF THE CERVICAL-CEREBRAL ARTERIES DISSECTION. FLOW-SPLITTER DISSECTION

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ABSTRACT

Background: Dissection of the cervical-cerebral arteries is an important cause of stroke in all age groups, specifically in younger population. Dissection of the cervical-cerebral arteries is produced by rupture of the intima and media layers, leading to the occurrence of an intramural haematoma. In several circumstances dissection of the cervical-cerebral has a peculiar aspect, of a permeable double arterial lumen.

Objective: We try to demonstrate the existence of this particularity in the dissection of the cervical-cerebral arteries, named as "flow-splitter" dissection.

Method: We have used a battery of tests with which we have tried to show in a coherent and reproducible manner the flow-splitter dissection in a cohort of approx. 30 patients, man and women, selected on the general basis of a regular screening Echo-Doppler investigation of the cervical-cerebral arteries, when we found non-specific flow alterations in these arteries.

The main methods of assessment were: Echo-Doppler evaluation of the cervical-cerebral arteries, with and without ultrasound contrast agent, CT-scan, MRI, angio-MRI, IVUS, DSA.

Results: By using the imaging techniques described above, part of the patients from the population previously described had specific alterations of the affected artery showing dissection with permeable double lumen, with different Doppler flow characteristics in the two lumen.

Administration of an ultrasound contrast agent is clearly showing the intravascular septum, which could be identified also during the IVUS. On the other hand DSA is not showing a narrowing of the artery caliber but only a prolonged remaining of the contrast agent at the level of suspected artery dissection.

Conclusion: Based upon the data gathered using the investigation methods described, it could be demonstrated that there is a particular type of dissection of the cervical-cerebral arteries, permeable double lumen dissection or "flow-splitter" dissection.

Key words: cervical arteries dissection, permeable double lumen dissection, Echo-Doppler, ultrasound contrast agent

Spontaneous dissection of internal carotid was presented for the first time by Jenzer in 1954. In the 70s Fisher and Mokri described dissection of vertebral arteries utilizing modern investigation techniques.

Classification of the cervical arteries dissections could be done in relation to the involved artery axis, the dissection could be produced: (on the carotidian axis, on the subclavial – vertebral arteries axis, simultaneous on the carotidian subclavial – vertebral

arteries axis); in relation to the histological type of the arteries involved in the dissection process, having clinical, paraclinical and evolutive particularities, they could be strictly extracranial, strictly intracranial, extracranial with intracranial extension, propagated from an aortic dissection with the latter involvement of the cervical arteries axis.

According to the producing mechanism there are 2 types: posttraumatic and spontaneous.

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According to the imagistic and anatomic-clinical-evolutive criteria, the cervical arteries dissection could be: with segmentary or longitudinal stenosis, with occlusion, with pseudoaneurism, with double lumen.

There will not be an exhaustive discussion on the “typical” carotid dissection which leads to stenosis or obstruction but we will describe an entity which is mostly unknown, with very rare and incomplete descriptions in the literature - the dissection of the cervical arteries with double, permeable lumen - this kind of dissection is separating the artery in two lumen, both permeable for the blood flow, separated by the intimal layer which is flapping into the artery.

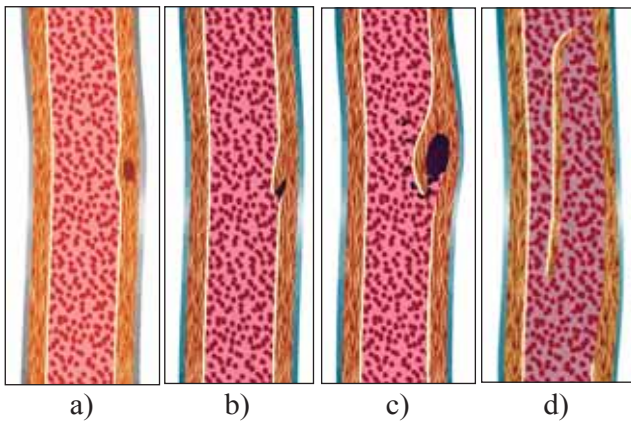


FIGURE 1. Model of the progression of a dissection with permeable double lumen: a) small intramural hematoma b) extension of the rupture of the intimal layer c) progression of intramural hematoma d) complete rupture of the vessel layers with occurrence of a permeable double lumen

Based upon the data gathered using a number of investigation methods: Echo-Doppler evaluation of



FIGURE 2. Echo – Doppler ultrasonography – a “septum” is visible in the internal carotid – the septum is separating the main lumen of the false lumen created by the carotid artery dissection.

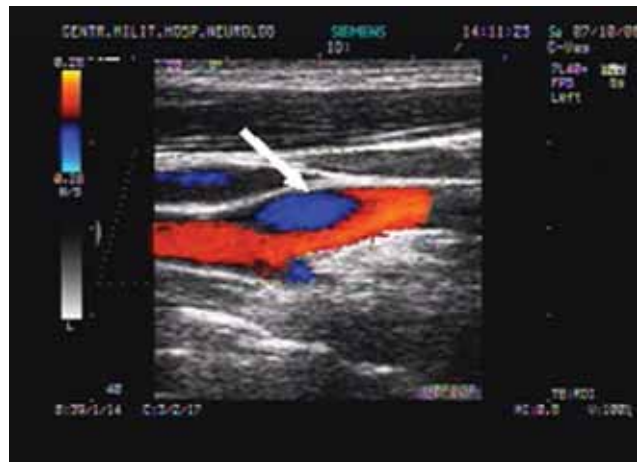


FIGURE 3. Echo – Doppler ultrasonography – color coded image shows two different blood flow patterns at the level of the internal carotid bulb – a faster one – specifically the main lumen and a slower one in the false lumen with backward flow in the internal carotid.

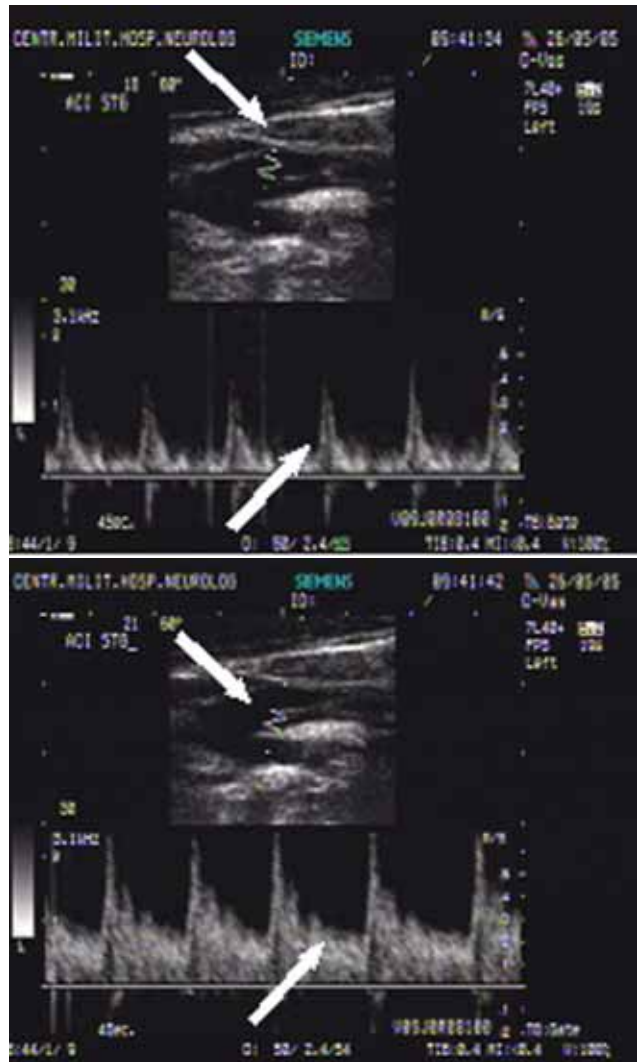


FIGURE 4. Echo – Doppler ultrasonography – sample gate positioned on one side and the other of the “septum” is showing different ultrasonography blood flow patterns – in the false lumen there is a non-specific blood flow pattern with decreased diastolic velocity, while in the main lumen there is a blood flow pattern very close to the normal.

the cervical-cerebral arteries, with and without ultrasound contrast agent, CT-scan, MRI, angio-MRI,



FIGURE 5. Administration of an ultrasound contrast agent is clearly showing the intravascular septum

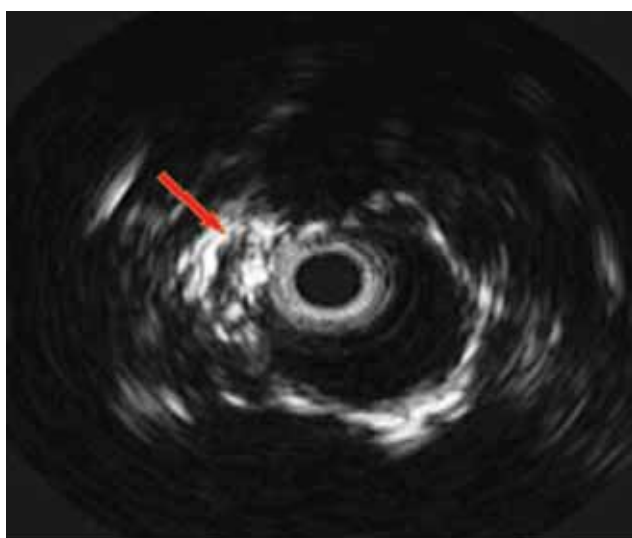


FIGURE 6. IVUS – a second smaller lumen is visible



FIGURE 7. DSA is not showing a narrowing of the artery caliber but only a prolonged remaining of the contrast agent at the level of suspected artery dissection

IVUS, DSA – in the studied population it could be demonstrated that there is a particular type of dissection of the cervical-cerebral arteries, permeable double lumen dissection or “flow-splitter” dissection. There is a presentation of the most suggestive features of this pathology.

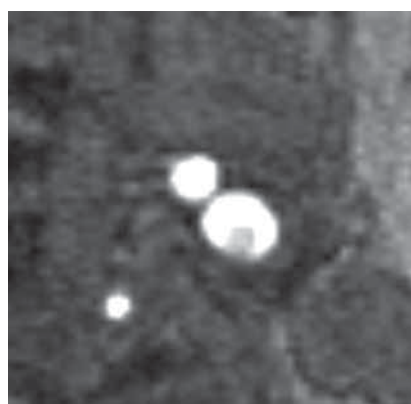
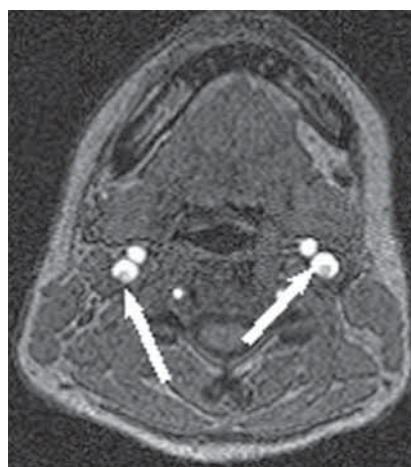


FIGURE 8. MRI – angiography (TOF sections) nonspecific blood flow modifications – augmented image in the right – both internal carotid arteries have a “semilune” pattern

RESULTS

By using the imaging techniques described above, part of the patients from the population previously described had specific alterations of the affected artery showing dissection with permeable double lumen, with different Doppler flow characteristics in the two lumens.

Administration of an ultrasound contrast agent is clearly showing the intravascular septum, which could be identified also during the IVUS. On the other hand DSA is not showing a narrowing of the artery caliber but only a prolonged remaining of the contrast agent at the level of suspected artery dissection (Figures 1-14).

CONCLUSION

Based upon the data gathered using the investigation methods described, it could be demonstrated

that there is a particular type of dissection of the cervical-cerebral arteries, permeable double lumen dissection or “flow-splitter” dissection.

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