

Case Report

The clinical examination in the patient with subarachnoid hemorrhage is still the most reliable parameter for predicting pathophysiological changes

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Abstract

Background: Macrovasospasms and delayed cerebral injury are factors which correlate with high morbidity in patients suffering a subarachnoid hemorrhage. Transcranial Doppler (TCD) ultrasonography and perfusion computed tomography (PCT) are diagnostic tools used to diagnose such pathologies. However, TCD is not very reliable and PCT exposes patients to radiation and cannot be performed daily.

Case Description: We present the case of a 47-year-old female with subarachnoid hemorrhage caused by rupture of an intracranial aneurysm. The aneurysm was coil embolized, and the clinical course of the patient was uncomplicated. She was writing notes about her stay in the intensive care unit. Without having any other complaints, she noticed that her writing became abruptly unrecognizable. TCD failed to show pathological signs, although PCT revealed decreased brain perfusion.

Conclusion: We rely more and more on our technical tools in medicine. However, clinical examination is and will stay the the first sign indicating cerebral pathologies and should remain the first priority to have an awake patient who can be examined routinely. In addition, we emphasize on the need of seeing the patient and not only the images. More than anything else, the patient is the first who shows signs of pathology and not the instruments (CT, TCD, etc.). The sentence “a fool with a tool is still a fool” should be present in every doctor’s mind to avoid mistakes and react appropriately.

Key Words: Aneurysm, perfusion CT, subarachnoid hemorrhage, transcranial Doppler

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INTRODUCTION

The second cause of disability in subarachnoid hemorrhage after hemorrhage itself is cerebral vasospasm and delayed cerebral ischemia (DCI), which occur in 50–70% of the patients.^[1,3]

Close clinical examination is mandatory for early detection of these ischemic complications. The disadvantage is that the examinations are not continuous and ischemic event may have progressed too far and the chance of a

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therapeutic intervention may have been missed by the time of pathological transcranial Doppler (TCD) or perfusion computed tomography (PCT).

However, imaging studies are important tools for detection of ischemic complications, especially when clinical symptoms occurred. Vasospasm and DCI seem to have different pathophysiological aetiologies and may not be detected by the same techniques. Spasms of the vessels of the circle of Willis can be detected by TCD ultrasonography, whereas microcirculation disturbances can be detected by perfusion imaging techniques. We present a case with physiological TCD but clinical signs of acute dysgraphia which correlated with a pathological PCT.

CASE REPORT

We present the case of a 47-year-old female admitted to our department with a ruptured posterior communicating artery aneurysm [Figure 1a]. The symptoms the patient complained of was thunderclap headaches without any further neurological disturbance (WFNS grade 1). The aneurysm was endovascularly treated without complication. The patient was immediately extubated, but was still complaining of strong headaches which is not atypical after coil embolization.^[4] PCT obtained 1 day after the treatment showed no elevated mean transit time (MTT). The TCD showed a Lindegaard Index of 1.5 and physiologic velocities. Three days after the treatment the patient showed an improvement of her headaches, and the routine PCT performed in our department was physiological. On day 8, the patient complained of an inability to write in her diary which she wrote from the first day of her stay. Because of the surfacing dysgraphia [Figure 1b and c], we performed a TCD which was physiological and a PCT which showed a perfusion deficit on the left hemisphere with an MTT of 4.1 s [Figure 1b-d]. After hypertonic treatment (RR systolic 150–170 mmHg), the dysgraphia disappeared and the following PCT showed physiological findings again. Throughout her stay the patient was administered nimodipine.

DISCUSSION

This case illustrates once again the importance of clinical examination of an awake patient and the different clinical images of pathophysiological changes. Would the patient be intubated we would have only the physiological PCT from day 1 to 3 and would perform another PCT on day 9 (regular timepoint), which could be too late to save her brain tissue. On the other hand, would the patient not keep a diary, the early symptoms of dysgraphia would not have been realized. TCD failed in completely diagnosing any vasospasm because the patient had a microcirculatory pathology.

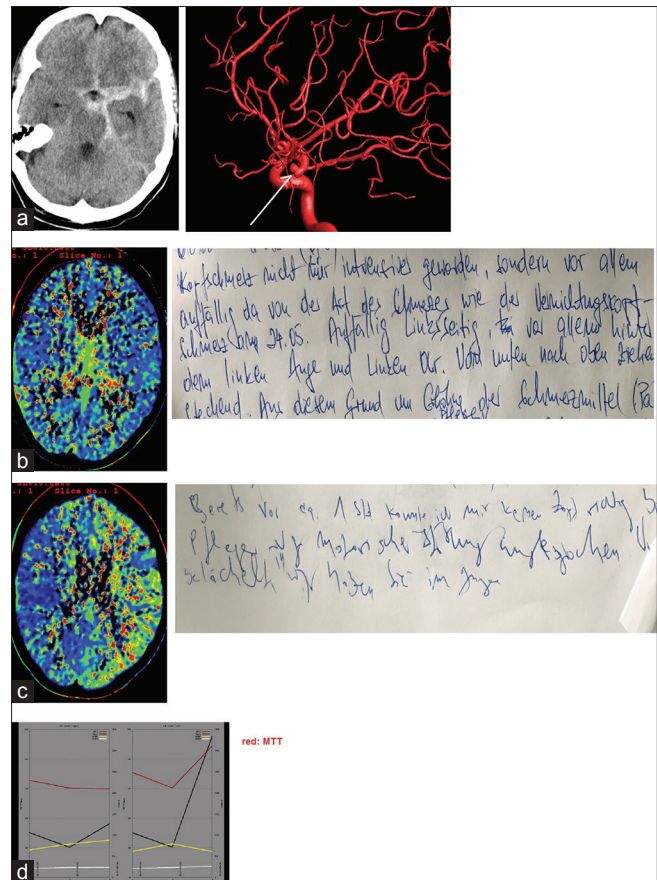


Figure 1: Subarachnoid hemorrhage after posterior communicating artery aneurysm rupture. (a) CT image showing the subarachnoid hemorrhage (left) and the 3D angiography showing the posterior communicating artery aneurysm (arrow), which ruptured and led to the hemorrhage (right). (b) Physiological perfusion CT and the physiologic graphic character of the patient. (c) Pathophysiological perfusion CT on the left hemisphere (green) and dysgraphia. (d) Graphical analysis of the right and left hemispheres showing a pathological MTT of 4.1 s (cut off: 3.9 s) on the left hemisphere in the PCT after dysgraphia occurred

The MTT is often used as an indirect parameter for detection of DCI-related perfusion deficits and is related to CBF and CBV by the equation: $MTT = CBV / CBF$.^[5] The MTT was considered to be affected by angiographic vasospasms as well as by microcirculatory disturbances.^[5] Those microcirculatory disturbances are a main component of DCI and several clinical studies confirmed a fairly high sensitivity of MTT in detecting DCI up to 70%.^[5] An MTT prolongation except vasospasm is an increased small vessel resistance as presented in a study of Xenon-CT and perfusion CT in the acute phase of aSAH where vasospasms are absent but a prolongation of MTT was present.^[2]

CONCLUSION

Whenever possible, patients need to be extubated as fast as possible to have a continuous clinical/neurological examination which still proves highly reliable.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The patient has consented to submission of this case report to the journal.

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Conflict of interest

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or

beliefs) in the subject matter or materials discussed in this manuscript.

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