

# The usefulness of ultrasonography of the optic nerve sheath in the evaluation of intracerebral haemorrhage

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## Introduction

Optic nerve sheath diameter (ONSD) measurement using ocular sonography has been performed for more than 10 years (1,2). Different ultrasound studies show that increased intracranial pressure leads to enlargement of the ONSD (3,4).

Here, we report the case of a patient with an extensive intracerebral haemorrhage in the left basal ganglia with midline shift.

A serial evaluation by means of ocular sonography demonstrated enlargement of the ONSD as well as papilloedema, without evidence of raised intracranial pressure (5).

## Case Report

On 13.01.09, a 58-year-old man was admitted to the neurocritical care unit of the Neurological Department of Giessen with aphasia and right hemiplegia. His Glasgow Coma Scale (GCS) score was 8.

A computed tomography (CT) scan revealed a hypertensive intracerebral haemorrhage of the left basal ganglia with midline shift from the left to the right side measuring 1.4 cm.

The patient received invasive intracranial pressure (ICP) monitoring with an intraparenchymal device and sedation.

We took repeated measurements of the ONSD and the papilla in order to monitor non-invasively the ICP



Fig. 1 - ONSD of left eye (affected side) on admission.



Fig. 2 - ONSD on the 07.03.09 reduced to 6.87 mm in both eyes without papilloedema on the right side.

and compared these data with repeated CT scans and the continuous measurements from the intraparenchymal device.

The ICP always remained under 20 mm Hg.

The ONSD on admission was 0.732-0.744 cm in the right and left eyes (Fig. 1). At the same time, papilloedema was detected in the left (0.83 mm) and in the right (0.73 mm) eye.

On 27.01.09, the midline shift reached its maximum: 9.2 mm on CT scan. On the same day, the papilloedema also reached its maximum: 1.32 mm in the left eye and 1.01 mm in the right eye.

Over the following days the midline shift reduced to 8.3 mm on the CT scan, while on the 25.02.09 the ONSD was 7.21 mm (right) and 7.15 mm (left). The papilloedema reduced to 0.87 and 0.89 mm.

The last follow up was conducted on 07.03.09. The CT scan revealed a reduction of the midline shift to 8 mm. The ONSD was down to 6.87 mm on both sides without papilloedema in the right eye (Fig. 2). The patient could finally be transferred for rehabilitation care.

## Discussion

To our knowledge this is the first case report of a patient with an extensive intracerebral haemorrhage in the left basal ganglia with midline shift detected by means of repeated ocular sonography. These results were compared with the findings of invasive monitoring of ICP, carried out with an intraparenchymal device, and neuroimaging. The measurements were strictly simultaneous.

Our measurements showed a strong correlation with the CT scan data. The ONSD fell from 7.44 mm on admission to 6.87 mm at discharge. The CT scan measurements improved, with a reduction of the midline shift from 9.2 to 8.0 mm.

We found, however, a bigger ONSD in comparison to other studies.

Geeraerts et al. found that ONSD could correlate with invasive ICP pressure. Changes in ONSD were also strongly related to changes in ICP. But in our patient, the ICP was always under 20 mm of Hg. Such ICP is associated with a very high probability of having an ONSD less than 5.86 mm (4).

Moretti et al. recently found, in 19 patients with raised ICP (>20 mm Hg), an ONSD on admission of 6.2±0.6 mm, a significantly higher value than in low ICP patients (5).

An explanation of our measurement is that ICP alone may not determine the distension of the ONSD. An intraparenchymal probe measures local pressure that can be compartmentalised and is not necessarily identical to intraventricular pressure (6). Finally, this patient could have a large ONSD (there are always outliers) without elevated ICP.

Intracerebral haemorrhage is a challenge for the vascular neurologist.

Our case illustrates that ocular sonography is a non-invasive and useful method for evaluating and follow up in patients with an intracerebral haemorrhage and could add other information about increased ICP.

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