

# SONOGRAPHIC DIAMETER OF OPTIC NERVE SHEATH IN BRAIN DEATH: A SERIES OF CASES

JMB Sousa, LN Duarte, MK Uehara, C Rouanet, E Rocha, V Gagliardi, FA Carvalho, RA Valiente, M Miranda, GS Silva

Stroke and Neurocritical Care Division, Department of Neurology and Neurosurgery, Federal University of São Paulo - UNIFESP, São Paulo, Brazil

## INTRODUCTION

Increased intracranial pressure (ICP) is considered the most important pathophysiological mechanism of brain death. Sonographic diameter of optic nerve sheath (ONSD) recently has been used to assess increased ICP.

## METHOD

We prospectively studied ten consecutive cases of patients with the diagnosis of brain death (BD) in the neurointensive care unit (NICU) of an university hospital, from April 2015 to January 2016.

All patients fulfilled the criteria for BD according to Brazilian Law (CFM, 1997). Transcranial Doppler was performed in all BD patients as a ancillary test, and ONSD was performed in all cases and also in control subjects, matched according to age and sex.

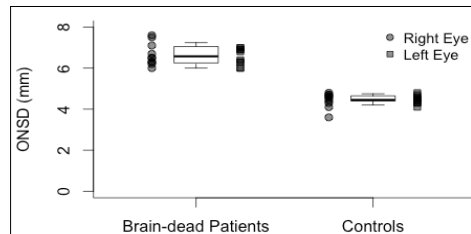
## RESULTS

In all cases of BD (mean age, 43 ±16), ONSD obtained were greater than 6.0 mm (mean, 6.61 ±0.44mm); control subjects (mean age, 49 ±15) presented with mean ONSD of 4.44 ±0.26mm (p<0.001). Results are shown in Figure 1 and Table 1.

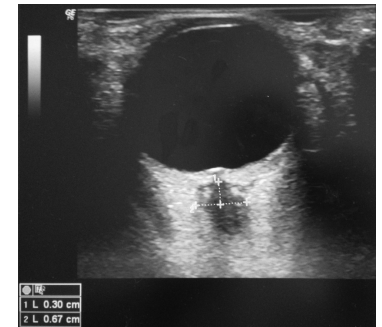
**Table 1.** Comparison of ONSD between patients and controls.

	Patients with Brain Death (n = 10)	Controls (n = 10)	P-value
Left ONSD ±SD (mm)	6.56 ± 0.40	4.46 ± 0.20	<0.001
Right ONSD ±SD (mm)	6.67 ± 0.55	4.43 ± 0.35	< 0.001
Mean ±SD (mm)	6.61 ± 0.44	4.44 ± 0.26	<0.001

Higher values of ONSD were found even in patients with external ventricular drains (EVD) or decompressive hemicraniectomy.



**Figure 1.** Optic nerve sheath diameter (ONSD) in patients with brain death and controls. Average values for both eyes are shown in the boxplots. Circles and squares represent ONSD of the Right and Left Eye for each patient.



**Figure 2.** Two-dimensional (B-mode) image of the eye globe of a representative patient with brain death, showing an enlarged ONSD (67 mm).

**Table 2.** Studies with ONSD in patients with Brain Death.

Studies	n	ONSD (mm)	Diagnosis
Lovrencic et al, 2012	10	7.20 ± 0.5	TBI, SAH, IS
Topcuoglu et al, 2015	29	8.34 ± 0.66	ICH, SAH, IS, CNS neoplasm

\* TBI, traumatic brain injury, SAH, subarachnoid hemorrhage, IS, ischemic stroke, CNS, central nervous system.

## DISCUSSION

ONSD measurement (Figure 2), a recently described technique for indirect detection of intracranial hypertension in the NICU setting, has a good correlation with ICP measurements by intraparenchymatous fiberoptic or intraventricular catheters, independent of age, gender or other variables, according to previous studies.

Indeed, the relationship between intracranial hypertension as the key mechanism of BD is well known. All of our control subjects had normal values of ONSD( ≤ 4.8 mm), while all our patients with brain death had values ≥ 6 mm.

To our knowledge, there are only two series describing ONSD in patients with brain death (Table 2).

Our study showed lower ONSD measurements in patients with BD than previously described, possibly due to the higher frequency of decompressive hemicraniectomy or EVDs in our series (40% of our patients, versus 17% reported by Topcuoglu et al).

## CONCLUSION

This report emphasize the importance of ONSD as an indirect method to measure intracranial hypertension and may help medical staff when normal values are obtained in diagnostic uncertainty setting of brain death. More studies are needed to confirm this hypothesis and find possible cut-points of OSND in this setting.



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Correspondence to: Jorge Murilo Barbosa de Sousa, MD  
E-mail: jorgemurilobs@gmail.com

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