

Computed Tomography Angiography in the Diagnosis of Brain Death: A Systematic Review and Meta-Analysis

Sergio Brasil¹, Marcelo de L Oliveira, Manoel J Teixeira, Luiz Marcelo S Malbouisson and Edson Bor-Seng-Shu

Department of Health and Human Services, University of São Paulo, Brazil

***Corresponding author:** Sergio Brasil, Principal Investigator, Department of Health and Human Services, University of São Paulo, Brazil, Tel: 5511981210990; E-mail: sbrasil@usp.br

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Letter

Recently, Kramer et al. published a meta-analysis describing the use of computerized tomography angiography (CTA) as a supplementary exam for diagnosing brain death (BD) [1]. The authors concluded that the routine use of CTA as a supplementary BD diagnostic test is not recommended until CTA diagnostic criteria have undergone further refinement and prospective validation.

Brazilian guidelines to determine BD demands two neurological clinical exams performed by two different physicians, complemented by an ancillary exam able to demonstrate the absence of cerebral blood flow, or brain metabolism, or electrical activity [2]. Currently, in Brazil as in the United States, CTA is not validated as an ancillary test for BD diagnosis [3]. However, CTA is a useful tool to verify presence of cerebral blood flow. Furthermore, some remarkable advantages with regard to this method worth to be mentioned, such as the exam equipment availability in various hospitals and its promptitude to acquire images. Otherwise, more complex, expensive or less available methods, such as digital subtraction angiography and trans cranial doppler ultrasonography, may not be accessible in many areas of Brazil. Thus, validation of CTA as a complementary diagnostic method for BD may be particularly important for patients awaiting organ transplantation.

The studies in this meta-analysis [1] included patients who fulfilled the local clinical criteria for brain death. CTA sensitivity ranged from 52.4% to 100%, especially due to image interpretation criteria heterogeneity between studies. The criteria were labeled as a 7-point scale based on the lack of opacification of the pericallosal and cortical segments of the middle cerebral arteries (MCAs), internal cerebral veins (ICVs), and the great cerebral vein, or as a 4-point scale based exclusively on the lack of opacification of MCAs cortical branches and ICVs. Standardizing all obtained data to a 4-point scale, Kramer et al.

[1] achieved a sensitivity of approximately 85%. Sensitivity increased to 99%, if exclusively considered the internal cerebral veins.

Up to 25% of patients diagnosed with BD may display blood perfusion on SPECT scan in some small cerebral areas for varying periods [4]. It is expected that cerebral blood flow may not have completely ceased at the time of clinical BD diagnosis. Therefore, the lack of cortical arterial branches and internal cerebral veins opacification, associated with opacification of proximal Willis polygon arteries does not contraindicate BD diagnosis in patients who fulfill criteria for clinical diagnosis of this condition.

Following these explanations, contrary to Kramer et al., we found out that current evidence has been reliable enough to encourage CTA use as a complimentary examination. Otherwise, agreeing with the authors, this method cannot be recommended as a screening tool for BD.

References

1. Kramer AH, Roberts DJ (2014) Computed Tomography Angiography in the Diagnosis of Brain Death: A Systematic Review and Meta-Analysis. *Neurocrit Care* 21: 539-550.
2. Conselho Federal de Medicina (1997) Resolução n° 1480 A morte encefálica será caracterizada através da realização de exames clínicos e complementares durante intervalos de tempo variáveis, próprios para determinadas faixas etárias. 18: 227-228.
3. Wijdicks EFM, Varelas PN, Gronseth GS, Greer DM (2010) Evidence-based guideline update: determining brain death in adults. *Neurology* 74: 1911-1918.
4. Bertagna F, Barozzi O, Puta E, Lucchini S, Paghera B, et al. (2009) Residual brain viability evaluated by (99m)Tc-ECD SPECT in patients with suspected brain death and with confounding clinical factors. *Nucl Med Commun* 30: 815-821.