

## Cerebral circulatory arrest detected by extracranial artery ultrasound



### Parada circulatoria cerebral detectada por la insonación de arterias extracraneales

Dear Editor,

It has been a pleasure to read Dr. Blanco's work,<sup>1</sup> "Cerebral circulatory arrest detected by insonation of extracranial arteries". We know that brain death (BD) diagnosis with doppler of extracranial arteries is accepted in other countries,<sup>2</sup> and we believe it is a useful alternative that could be considered as complementary evidence, added to clinical neurological examination. However, we would like to add two comments:

First, we believe that it is important to emphasize that the phenomenon pursued with the flow tests in BD is derived from the theory of Monro-Kelly, in which it is assumed that the intracranial content (central nervous system, cerebrospinal fluid and blood) is constant. The disruption of this equilibrium, taken to the extreme, is what causes cerebral circulatory arrest at this level. In this sense, the assessment of extracranial vessels should not replace other techniques used to complete the instrumental diagnosis of BD, such as transorbital doppler or duplex color with or without contrast, which confirm the absence of intracranial flow, the true pathophysiological responsible for the onset of the brain death process.

Secondly, we want to point out that the use of confirmatory tests in BD aims, among other objectives, to avoid the diagnostic delay that could happen if you only refer to clinical examinations. In the case presented by Dr. Blanco, he

talks about a period of observation of 16 h until the extracranial diastolic flow inversion pattern is captured.

Therefore, although we thank Dr. Blanco for his advice, we believe it is appropriate to recommend other BD confirmatory alternatives before using the extracranial artery flow analysis.

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### Conflict of interest

There is no conflict of interest.

### References

1. Blanco P. Cerebral circulatory arrest detected by insonation of extracranial arteries. *Med Intensiva*. 2016, <http://dx.doi.org/10.1016/j.medin.2016.07.006>.
2. Walter U, Schreiber SJ, Kaps M. Doppler and duplex sonography for the diagnosis of the irreversible cessation of brain function ("Brain Death"): current guidelines in Germany and neighboring countries. *Ultraschall Med*. 2016;37:558–78.

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## Reply to "Cerebral circulatory arrest detected by extracranial artery ultrasound"



### Respuesta a «Parada circulatoria cerebral detectada por la insonación de arterias extracraneales»

Dear Editor,

Thank you very much to Dr. Revuelto Rey and Egea-Guerrero for interest in the image-based case. In these types of submissions, there is usually no room for detailed explanations; fortunately, here there is room to do so.

The use of transcranial Doppler (TCD) is widely accepted in many countries for the assessment of the "intracranial" artery flow when evaluating for cerebral circulatory arrest (CCA). For this indication, Doppler insonation of middle cerebral arteries (MCA) as well as basilar artery (BA)/intracranial vertebral arteries is preferred over

transorbital insonation of the intracranial (carotid siphon) internal carotid artery (ICA) or transcervical (extracranial) ICA insonation.<sup>1</sup> While the insonation of extracranial ICA and transorbital ICA has shown a high specificity for diagnosing CCA, this finding comes up late in comparison with insonation of MCA and BA,<sup>2</sup> thus requiring serial examinations and long observation periods, as seen in the case presented. This obviously means that when an early confirmation of brain death is mandatory (for example, in organ donation), the isolated use of extracranial artery or transorbital insonation is not probably the best option.<sup>2</sup>

From another perspective, ultrasound is nearly all we have in many small centers as an ancillary test for confirming brain death and many intensivists give up when they cannot find an MCA and BA flow. This is probably the most important point of the case, teaching that extracranial artery insonation is feasible and reliable, showing the same flow CCA patterns (although in a late fashion and this must be especially remembered) as insonation of intracranial arteries and useful when no other ancillary test is available.