

Cerebral CT Angiography as an ancillary investigation to support the diagnosis of Death by Neurological Criteria

Background

The diagnosis of Death by Neurological Criteria (DNC) is a clinical diagnosis using the brainstem death criteria as described by the Academy of Medical Royal Colleges (AoMRC) Code of Practice¹ and incorporated by the Faculty of Intensive Care Medicine and the Intensive Care Society in the 2021 “Form for the Diagnosis of Death using Neurological Criteria”.² The AoMRC does not routinely recommend ancillary investigations to support the diagnosis of DNC, though advises consideration in certain scenarios. The use of cerebral CT angiography as an ancillary investigation has now been recommended for use within the UK to support the diagnosis of DNC.³

Indications

Cerebral CT angiography is indicated where there is a strong clinical suspicion that death has occurred. It should be additional to the fullest examination and clinical testing in the given circumstances.

Cerebral CT Angiography is required:

1. Where a comprehensive neurological examination (including the apnoea test) is not possible*
2. Where continuing effects of confounding conditions cannot be excluded

Cerebral CT Angiography should be considered:

1. Uncertainty regarding the interpretation of possible spinally mediated movements
2. To promote understanding of the clinical confirmation of death using neurological criteria to families who are uncertain or unaccepting.

*The testing of the pupillary, corneal and oculo-vestibular may be prevented on one or other side by local injury or disease. This does not invalidate the diagnosis of death as a result of cessation of brainstem reflexes. In the case of bilateral injury or disease, cerebral CT angiography should be considered.¹

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Requesting Cerebral CT Angiography

The CT request should be discussed with the duty DCN radiologist (for all NHS Lothian sites). Both the verbal and TRAK requests should state that the investigation is supporting the clinical diagnosis of DNC. Cerebral CT angiography is available during weekdays 9am-5pm. Whilst not anticipated to be an urgent/emergency scan, cerebral CT angiography may be available during weekend daytime working hours following discussion with the duty DCN radiologist.

If the patient has had a CT scan with contrast within 24-hours of cerebral CT angiography, the duty radiologist must be made aware. This may confound interpretation.

Cerebral CT Angiography Protocol

Cerebral CT angiography, when used to support DNC, is highly protocolised to reduce variation in technique and is based on the 4-point Frampas study.⁴

1. Patient should have an 18G cannula (or larger bore) sited in a large vein.
2. Mean arterial pressure (MAP) must be confirmed to be above 60mmHg during scanning.
This MUST be documented with the patient's notes on TRAK once the CT transfer is complete.
3. The initial scan is acquired before injection of contrast.
4. The second scan is acquired at 20-seconds after commencing contrast injection.
5. The third scan is acquired at 60 seconds after commencing contrast.

Cerebral CT Angiography Report

A verified report will be available on TRAK. The scan will be reported by two neuroradiology consultants (RIE) or the duty radiology consultant with one neuroradiology consultant (WGH/RIE).

The report will be standardised and will include the following to support DNC:

1. Absence of pre-existing vascular density (which could confound interpretation).
2. Opacification of superficial temporal arteries on the second scan to confirm the correct injection of contrast.
3. The absence of contrast opacification in the 4-vessels (cortical segments of left and right middle cerebral arteries, left and right internal cerebral veins).

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References

1. Academy of Medical Royal Colleges. A code of practice for the diagnosis and confirmation of death. 2010. www.aomrc.org.uk/reports-guidance/ukdec-reports-and-guidance/code-practice-diagnosis-confirmation-death.
2. The Intensive Care Society. Form for the diagnosis of death. [https://www.ficm.ac.uk/sites/ficm/files/documents/2021-10/Form for the Diagnosis of Death using Neurological Criteria-long version.pdf](https://www.ficm.ac.uk/sites/ficm/files/documents/2021-10/Form%20for%20the%20Diagnosis%20of%20Death%20using%20Neurological%20Criteria-long%20version.pdf)
3. Thomas EO, Manara A, Dineen RA, et al. The use of cerebral computed tomographic angiography as an ancillary investigation to support a clinical diagnosis of death using neurological criteria: a consensus guideline. *Anaesthesia* 2023;**78**:330-336
4. Frampas E, Videcoq M, de Kerviler E, et al. CT angiography for the diagnosis for brain death diagnosis. *American Journal of Neuroradiology* 2009;**30**:1566-70

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