**The accuracy of transcranial doppler in the assessment of vasospasm in patients with aneurysmal subarachnoid haemorrhage**

**Descriptor:**

The accuracy of transcranial doppler in the assessment of vasospasm in patients with aneurysmal subarachnoid haemorrhage

**Background:**

Patients with aneurysmal subarachnoid haemorrhage (SAH) represent a significant caseload within clinical neuroscience centres within the United Kingdom, with SAH occurring with an incidence of  approximately 9/100,000 person-years (de Rooij et al., 2007).  If patients survive the initial ictus then their outcomes are critically dependent upon the early detection and management of vasospasm.  Vasospasm can lead to delayed cerebral ischaemia (DCI) and is the most common cause of late mortality and morbidity occurring in up to 40% of patients (Rabinstein et al., 2004).

Imaging is critical in the management of these patients to a) assess for the presence of vasospasm and b) assess the response to therapy, particularly as vasospasm unresponsive to medical management may warrant endovascular treatment: angioplasty or intra-arterial administration of vasodilators (Datar and Rabinstein, 2017; Sokolowski et al., 2018).

The traditional method for the assessment of vasospasm is with catheter angiography (CA) however this is an invasive technique and requires radiation exposure, as does the use of CT angiography (CTA). This makes both modalities unsuitable for the daily monitoring of the response to treatment and also for the early detection of vasospasm (when imaging is of particularly importance in sedated patients who cannot be fully assessed neurologically). Furthermore both of these techniques require the transfer of often systemically unstable patients from the intensive care unit (ICU) to the neuroradiology department, which is both labour intensive and time consuming.

Transcranial doppler (TCD) is a safe, non-invasive bedside modality which can readily be performed in the ICU setting and is now a commonly accepted method for identifying vasospasm with high sensitivity for the detection of DCI (Kumar et al., 2016). As is the case however with ultrasound imaging, TCD is highly operator dependent and its accuracy is dependent upon the training and experience of the operator (Egido et al., 2016).

The accuracy of the technique as an alternative to CA/CTA therefore needs to be regularly assessed and so the objective of this audit is to:

1. Assess the accuracy of TCD in the identification of patients with vasospasm through a comparison with CA/CTA.

2. Identify possible causes for any discordance.

## The Cycle

**The standard:**

The Neuroradiology transcranial doppler service should be able to detect vasospasm within the middle cerebral arteries (MCA) to the same diagnostic accuracy as is accepted in current clinical practice.

**Target:**

70%

(from previous studies by Mastantuono et al., 2018 and Swiat et al., 2009 demonstrating sensitivities/accuracy of TCD in identifying MCA vasospasm from  67% - 77%).

## Assess local practice

**Indicators:**

Percentage of cases in which vasospasm within the middle cerebral arteries has been detected with TCD.

**Data items to be collected:**

**1**. From the radiology information service (RIS) or electronic health record system (EPHR) identify all TCDs performed over a 6 month period.

**2**. Within this group, identify:

-  All patients who also underwent CA or CTA **on the same day** (same day studies are required as vasospasm is a dynamic process and an evaluation of concordance between TCD and angiography requires studies to be performed within a short interval of one another).

**3**. For those having undergone TCD + angiography **on the same day**, record from the reports:

- For TCD: Presence of vasospasm in left/right MCA (additional information which could be collected is the severity of vasospasm: mild/moderate/severe). Any additional information such as patient agitation, limited acoustic window.

Operator: Consultant/Fellow/StR/Sonographer

- For Angiography: Presence of vasospasm in left/right MCA (and severity).

**4**. Calculate the number of cases in which TCD detected vasospasm compared to angiography (specificity could also be calculated).

**Suggested number:**

All cases performed in the previous 6 month period who had TCD and CA/CTA on the same day (aim for 50 cases).

**Suggestions for change if target not met:**

1. For those cases in which the **TCD results were discordant to angiographic findings**, identify:

- If this could relate to the experience of the operator (consultant vs neuroradiology fellow/StR vs sonographer).

- If any additional information was provided as to why the TCD study may have been suboptimal. This may include whether the patient was agitated and if there were any accessibility issues such as in those patients having undergone pterional craniotomy (reducing the acoustic window due to swelling/surgical dressings).

2. Aim to present the findings at the local clinical governance meeting for the Neuroradiology department. Discuss potential methods to improve the accuracy of the TCD service which could include more training sessions in those participating in the service provision.

Aim to present the findings to the relevant stakeholders within the Departments of Neurosurgery and Neuroanaesthesia.

**Resources:**

Review of RIS and EPHR

[**tcd\_case\_selection\_and\_data\_collection.pdf**](https://www.rcr.ac.uk/sites/default/files/audit_template/tcd_case_selection_and_data_collection.pdf)PDF - 64.54 KB

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