Safety and effectiveness of intrathecal nicardipine for the treatment of subarachnoid hemorrhage

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**Useful definitions**

* **Cerebral angioplasty**: a type of endovascular rescue treatment utilized for the treatment of delayed cerebral ischemia. This is achieved via mechanical manipulation of narrowed cerebral vasculature via balloon inflation.
* **Delayed cerebral ischemia (DCI):** any neurological deterioration including hemiparesis, aphasia and/or altered consciousness presumed to be related to ischemia that persists for more than an hour and cannot be explained by other physiological abnormalities noted on the standard radiographic, electrophysiological, or laboratory findings.1
* **Transcranial Doppler (TCD):** measures blood flow velocities via ultrasound in the major branches of the Circle of Willis through an intact skull. This measurement is performed at bedside and has several uses including detection of vasospasm.2 TCD has been used for monitoring of patients with aSAH, but studies regarding its sensitivity and specificity for the detection of vasospasm/DCI are inconclusive.1
* **Vasospasm**: arterial narrowing after subarachnoid hemorrhage demonstrated by radiographic images or sonography that can lead to cerebral ischemia or infarction.1

**Assessment scale for the amount of blood seen on initial head CT**

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| Modified Fisher scale6 |
| Grade 0  | No SAH or IVH |
| Grade 1 | Focal or diffuse thin SAH; no IVH |
| Grade 2  | Focal or diffuse thin SAH; IVH present |
| Grade 3  | Focal or diffuse thick SAH; no IVH |
| Grade 4  | Focal or diffuse thick SAH; IVH present |
| IVH: intraventricular hemorrhage; SAH: subarachnoid hemorrhage  |

 **Assessment scale for patient’s initial neurological presentation**

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| Hunt and Hess scale7  |
| Grade 1 | Asymptomatic, mild headache, slight nuchal rigidity  |
| Grade 2 | Moderate to severe headache, nuchal rigidity, no neurologic deficit other than cranial nerve palsy  |
| Grade 3 | Drowsiness, confusion, mild focal neurologic deficit |
| Grade 4  | Stupor, moderate-severe hemiparesis |
| Grade 5  | Coma, decerebrate posturing |

**Examples of intrathecal (IT) nicardipine effectiveness in the literature**

* In 2010, Webb and colleagues explored the effects of IT nicardipine for treatment of cerebral vasospasm in forty-two patients. They concluded that IT nicardipine was associated with a significant and sustained reduction in mean cerebral blood flow velocity as measured by transcranial Doppler (TCD).3
* In 2008, Goodson and colleagues described eight patients (median Hunt-Hess grade = 2, median Fisher score = 4) with refractory vasospasm that received IT nicardipine (4 mg every 12 hours) for 5-17 days. Six of the eight patients were discharged home with moderate to good outcomes (median Rankin score = 2).4
* Rankin Scale is used as a functional outcome measure after stroke
* Encompasses scores: 0= no symptoms at all; 1= no significant disability; 2 = slight disability; 3 moderate disability; 4 = moderately severe disability; 5 = severe disability.5

**IT nicardipine preparation and administration pearls at Harborview Medical Center**

* Nicardipine 4 mg (1.6 mL) + 0.4 mL of preservative free normal saline (total volume = 2 mL)
* Dispensed in a 10 mL syringe
* Expiration time: 4 hours from preparation time
* “FOR INTRATHECAL USE ONLY” sticker required on all bags that contain the final syringe
* Administration of drug restricted to neurosurgery residents/attending physicians only
* Mask and sterile gloves are worn at all times during administration
* 2 mL of cerebrospinal fluid (CSF) is removed before instillation of drug
* Nicardipine (4 mg/2 mL) is administered into ventricle via an EVD over 1 minute
* Extraventricular drain (EVD) is clamped for 1 hour as intracranial pressures (ICP) tolerate
* If ICP >20 mm Hg for > 5 minutes, EVD is reopened

**References**

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