Background:
While blunt cerebrovascular injuries (BCVI) occurs in only 0.5 to 1.2%\textsuperscript{1,2} of blunt trauma patients, the complications of missed injury resulting in stroke are devastating. A clinically latent period ranging from 10 -72 hours provides a short window of opportunity to make the diagnosis and initiate treatment (anti-thrombotic therapy or anticoagulation) prior to the onset of neurologic damage. Treatment is inexpensive and effective, shown to decrease the stroke rate from 21 to 0.5%\textsuperscript{3}. While cerebral angiogram remains the gold standard for diagnosis of BCVI\textsuperscript{4}, our institution utilizes multi-slice CTA secondary to immediate availability and improved CT technology. The clinical challenge is to identify patients at high risk of BCVI to make a prompt diagnosis and initiate treatment. Treatment of BCVI with other injuries contradicting immediate anti-platelet/anti-coagulation is controversial and is currently being studied at this institution.

Procedure:
The following injury patterns resulting from high energy transfer mechanism (including flexion/extension injuries) place the patient at high risk for BCVI and are indications for CTA neck\textsuperscript{5}.
--Complex facial fractures (LeFort II or III)
--Mandible fracture
--Basilar skull fracture or occipital condyle fracture
--Cervical vertebral body or transverse foramen fracture at any level (C1-7)
--Any fracture at level C1-C3
--Cervical subluxation or ligamentous injury at any level
--Severe traumatic brain injury (TBI) with GCS < 6
--Neurological exam incongruous with head CT
--Near hanging with anoxic brain injury
--Seatbelt or other clothesline-type injury with significant swelling, pain, or AMS
--combined TBI and major thoracic injury
--Scalp degloving injury
--Thoracic vascular injury

The following signs and symptoms of BCVI are indications for CTA neck
--potential arterial hemorrhage from neck/nose/mouth
--cervical bruit in patient < 50 years of age
--cervical hematoma
--focal neurologic defect: TIA, hemiparesis, vertebrobasilar symptoms, Horner’s Syndrome
--neurologic deficit inconsistent with head CT
--stroke on CT or MRI
Diagnosis:

Screening CTA neck should be performed no later than 6 hours from time of ED arrival. Ideally, the CTA neck is performed at the time of the original diagnostic CT scan for blunt trauma once the above risk factors are identified. If the need for CTA neck is decided after the original IV contrast CT scan, discussion with the responsible attending should occur in patients at high risk for contrast induced nephropathy. For these high risk patients, a 1 liter bolus of LR should be given prior to repeat CTA neck.

If the patient is unable to get a CTA neck in a timely fashion, consider starting non-enteric coated aspirin 325 mg daily in the patient with no contraindication to therapy (TBI, SCI, solid organ injury) prior to confirming the diagnosis.

If clinical suspicion of BCVI remains high despite a negative CTA neck, please consult the Neurosurgery Vascular service (713-327-0536) for cerebral angiogram and start non-enteric coated aspirin 325 mg daily immediately in the patient with no contraindication to therapy (TBI, SCI, solid organ injury). Consider angiogram if CTA neck is positive for injury and patient has a contraindication to aspirin (active peptic ulcer, documented aspirin allergy, hemophilia, von Willebrand’s disease).

Please notify the trauma neurosurgery team once the diagnosis of BCVI is made at one of the following numbers:

NSGY portable phone: 713-704-7929
NSGY pager: 713-327-3219
Treatment:

Isolated BCVI without neurologic symptoms: non-enteric coated Aspirin 325 mg daily
--start immediately after diagnosis

Isolated BCVI with neurologic symptoms: Heparin drip
--no bolus, goal PTT 40-50
--start immediately after diagnosis
--please use heparin weight based protocol orders for blunt carotid or vertebral artery injury

MPP in Care4

BCVI with traumatic brain injury or spinal cord injury
--start non-enteric coated aspirin or heparin after cleared by Neurosurgery attending physician
--goal is within 48 hours of stable head CT and exam

BCVI with solid organ injury
--start non-enteric coated aspirin or heparin at discretion of Trauma attending physician
--goal is within 24 hours after stable H&H

Follow-up therapy

Patients should receive a repeat CTA neck 7 days after diagnosis if they remain in the hospital. Aspirin or heparin may be stopped if CTA reveals resolution of injury. If patients are discharged prior to repeat CTA or repeat CTA neck shows persistent injury, the patient is sent discharged on ASA 325 mg daily with instructions to call the Neurosurgery clinic at 713-704-7100 for follow-up appointment.

Denver Grading Scale for BCVI

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>Grade 1</td>
<td>Irregularity of vessel wall or a dissection/ intramural hematoma with &lt;25% luminal stenosis</td>
</tr>
<tr>
<td>Grade 2</td>
<td>Intraluminal thrombus, raised intimal flap, or dissection/ intramural hematoma with ≥ 25% luminal narrowing</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Pseudoaneurysm</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Vessel occlusion</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Vessel transection</td>
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References: