Blunt Cerebrovascular Injury (BCVI)

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Purpose

To provide a comprehensive guideline for the screening, diagnosis, and management of Blunt Cerebrovascular Injury (BCVI) in trauma patients.

Scope

Applicable to all patients presenting with suspected or confirmed BCVI.

Background

- **Incidence**: BCVI affects approximately 1 in 1000 hospitalized trauma patients, with an increased detection rate due to advances in non-invasive imaging (Biffl et al., 2020).
- **Morbidity & Mortality**: Neurologic morbidity can reach 80%, with mortality approaching 40% (Kim et al., 2020). The annual risk of stroke is 20%, but this can be reduced to 1% with appropriate antiplatelet and anticoagulation therapies (Murphy et al., 2021).
- **Risk Factors**: Common mechanisms include high-energy trauma, such as motorcycle accidents, and specific injuries like cervical spine fractures and severe blunt force trauma to the neck (Brommeland et al., 2019).

Biffl Classification System

The Biffl classification system is used to grade BCVI based on angiographic findings and clinical presentation. The classification is as follows:

- **Grade I**:
    - Minor intimal injury with no evidence of stenosis or occlusion.
    - Typically managed conservatively with antiplatelet therapy.
- **Grade II**:
    - Moderate intimal injury with <50% stenosis.
    - Antiplatelet therapy and close monitoring recommended.

- **Grade III**:
    - Severe intimal injury with >50% stenosis but no occlusion.
    - Antiplatelet therapy and potential interventional management required.
- **Grade IV**:
    - Complete occlusion of the vessel without collateral circulation.
    - May require interventional treatment, such as stenting.
- **Grade V**:
    - Transection of the vessel or major vascular injury.
    - Surgical intervention is typically necessary.

Guidelines

Evaluation, Screening, and Diagnosis

Initial Evaluation

- All patients with suspected BCVI should undergo a CT Angiogram (CTA) of the neck (Biffl et al., 2020).

Indications for Imaging

- **Trauma Mechanisms**:
    - High-energy transfers (e.g., motorcycle accidents)
    - Seat belt marks or soft tissue neck injuries
    - GCS < 8 (not explained by head CT)
    - LeFort II or III facial fractures
    - Mandibular or skull base fractures (e.g., petrous)
    - C-spine fractures (C1-C7) and related injuries
    - Significant thoracic blunt force trauma
    - Blunt cardiac injuries

- **Signs/Symptoms**:
    - Arterial bleeding from head, nose, mouth, or neck
    - Audible neck bruits
    - Neck hematoma
    - Focal neurological deficits (e.g., TIAs, Horner's syndrome)
    - Neurological findings inconsistent with head CT
    - Stroke evident on CT or MRI

Imaging Protocol

- Obtain CTA of the neck.
- If CTA results are equivocal, consider a diagnostic angiogram if suspicion remains high (Kim et al., 2020).

Grading

- Use the Biffl classification system to categorize BCVI severity.

Consultations

- Refer to the Interventional Neurovascular Service as appropriate (Biffl et al., 2020).

Management

Symptomatic BCVI

- **Definition**: Presence of neurological deficits or imaging consistent with stroke.

Management by Grade:

- **Grade I**:
    - Obtain MRI brain (stroke protocol).
    - Initiate antiplatelet therapy unless contraindicated.
    - Consider heparin infusion in high-risk bleeding patients.
    - Monitor via parenchymal imaging (MRI/CT) in 3 days.
    - Follow-up vascular imaging in 72 hours.

- **Grade II**:
    - Similar management as Grade I.
    - Consider Interventional Neurovascular consultation if symptoms persist or worsen.
- **Grade III**:
    - Antiplatelet therapy and Interventional Neurovascular consultation.
    - Monitor closely; consider endovascular intervention if symptoms worsen.
- **Grade IV**:
    - Interventional treatment (e.g., stenting) is usually required.
    - Consult with Interventional Neurovascular Service immediately.
- **Grade V**:
    - Surgical intervention required; refer to the appropriate surgical team.

Asymptomatic BCVI

- **Grade I**:
    - Initiate Aspirin 325 mg po/pr unless contraindicated.
    - Consider heparin if contraindicated; follow similar protocols for transition to Aspirin.
    - Follow-up imaging in 72 hours.
- **Grade II**:
    - Similar to Grade I.
- **Grade III - V**:
    - Consult Interventional Neurovascular Service and follow similar protocols for antiplatelet therapy and imaging.

Disposition

- Admit all BCVI patients to the ICU for neuro checks every hour for at least 24 hours.
- Antithrombotic therapy should be initiated when feasible, with follow-up imaging performed in 72 hours.
- Patients must not be discharged until follow-up imaging demonstrates stable or resolved lesions.

Long-Term Management

- **Vertebral Artery Injury**:
  - Aspirin 325 mg daily for 3 months.
  - Follow-up imaging in 3 months and outpatient follow-up with Neurovascular and Trauma services.
- **Carotid Artery Injury**:
  - Similar management as vertebral injuries.

Version Control Record			
Version	**Date**	**Author / Reviewer**	**Description of Changes**
1	**08/21/2024**	**Paul Wisniewski, D.O.**	**Initial review and update to reflect latest evidence/practice**

References

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3. Murphy, P. B., Severance, S., Holler, E., Menard, L., Savage, S., & Zarzaur, L. B. (2021). Treatment of asymptomatic blunt cerebrovascular injury (BCVI): a systematic review. *Trauma Surgery & Acute Care*, 66(1), 1-8. Link
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These guidelines aim to enhance the standard of care for patients with BCVI and should be regularly updated in accordance with emerging evidence.

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