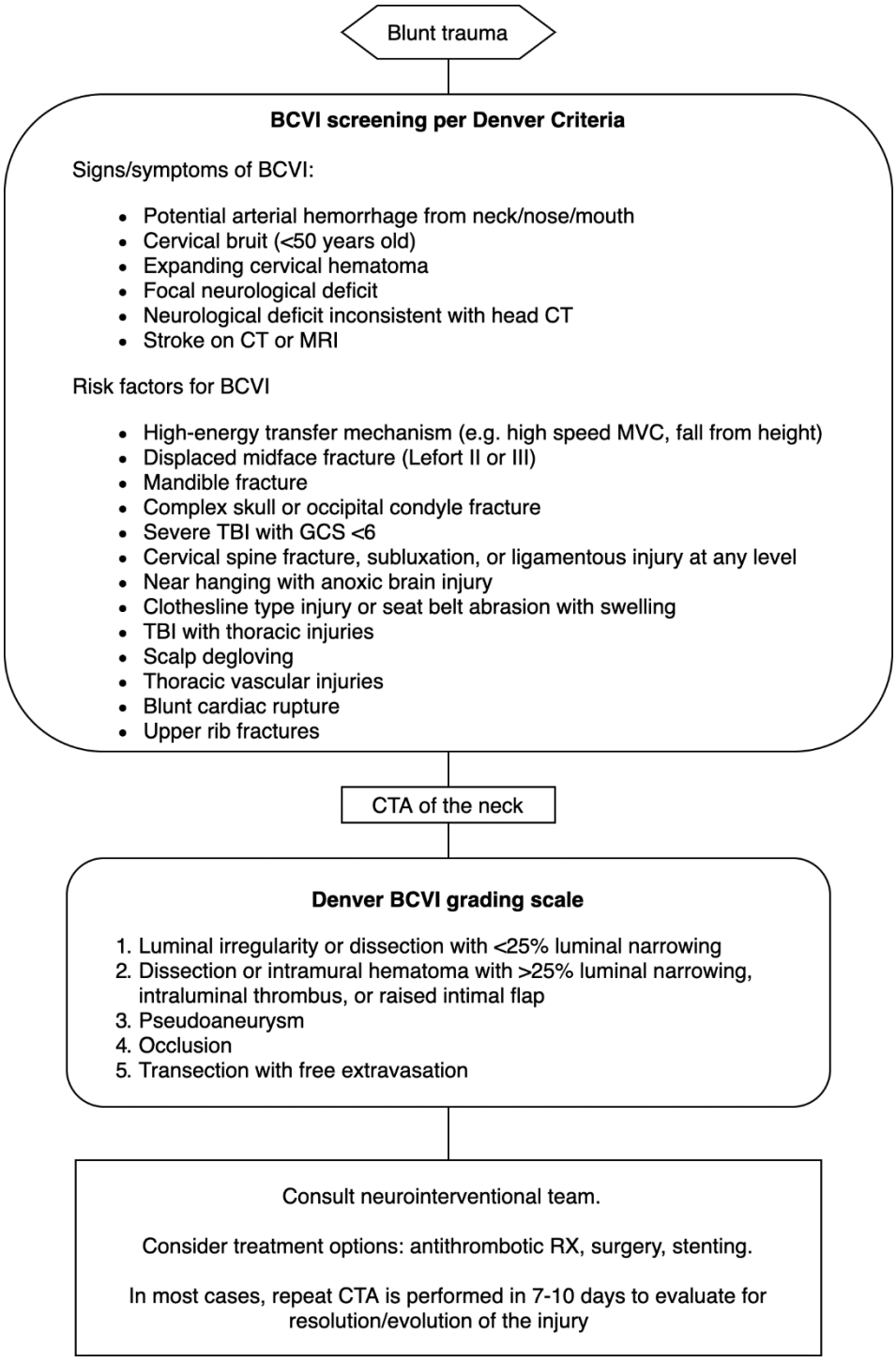
SCREENING AND TREATMENT FOR BLUNT CEREBROVASCULAR INJURY (BCVI)



WHO SHOULD READ THIS PROCEDURE:
This procedure shall be read by WPP Surgery and all practitioners caring for the trauma patient.

SUMMARY:

I. Screening for BCVI is performed with CTA of the neck according to the Denver criteria.
II. Antithrombotic therapy deceases the risk of stroke and improves neurologic outcomes.
III. Follow-up imaging is important, as lesions may improve or worsen over time.

Purpose: Define screening criteria and treatment of BCVI.

Contributing specialties: Trauma surgery, Neurointerventional, Emergency medicine, Radiology

BACKGROUND:

I. Blunt (non-penetrating) carotid and blunt vertebral artery injuries are collectively referred to as blunt cerebrovascular injuries (BCVI).
II. BCVI occurs in approximately 1% of patients with blunt trauma admitted to a trauma center. Rates are five-fold higher in patients with severe head, face, and/or cervical spine injuries[1-4].
III. The pathologic insult in most cases is an intimal tear. The exposed subendothelial collagen promotes platelet aggregation and thrombus formation, which may occlude the vessel altogether or embolize to the cerebral circulation. In some instances, this process develops into a pseudoaneurysm[5].
IV. Early diagnosis and treatment is critical to reducing the risk of stroke and mortality in patients with BCVI[6-9].
V. Screening is performed with CTA of the neck according to the Denver criteria[10].
VI. Neurologic deficits may not be present on initial exam. Up to half of patients develop neurologic symptoms >12 hours after injury[11,12].
VII. Treatment options include antithrombotic therapy (most common), surgery, and/or endovascular stenting. Antithrombotic therapy deceases the risk of stroke and improves neurologic outcomes[13-20].
VIII. Follow-up imaging is important, as lesions may improve or worsen over time[21].

Denver screening criteria (expanded)[2]: If operative management is not immediately indicated consider CTA of the neck based on the following criteria.

Denver Criteria
Signs/symptoms of BCVI
Potential arterial hemorrhage from neck/nose/mouth
Cervical bruit in patient <50 y old
Expanding cervical hematoma
Focal neurologic defect: TIA, hemiparesis, vertebrobasilar symptoms, Horner's syndrome
Neurologic deficit inconsistent with head CT
Stroke on CT or MRI
Risk factors for BCVI
High-energy transfer mechanism
Displaced midface fracture (LeFort II or III)
Mandible fracture
Complex skull fracture/basilar skull fracture/occipital condyle fracture
Severe TBI with GCS <6
Cervical spine fracture, subluxation, or ligamentous injury at any level
Near hanging with anoxic brain injury
Clothesline type injury or seat belt abrasion with significant swelling, pain, or altered mental status
TBI with thoracic injuries
Scalp degloving
Thoracic vascular injuries
Blunt cardiac rupture
Upper rib fractures

Denver Grading Scale:

1. Luminal irregularity or dissection with <25% luminal narrowing
2. Dissection or intramural hematoma with >25% luminal narrowing, intraluminal thrombus, or raised intimal flap
3. Pseudoaneurysm
4. Occlusion
5. Transection with free extravasation

Imaging:

I. All WakeMed CT scans are >16-slice, therefore meeting image quality recommendations.
II. CTA of the neck is performed in conjunction with CTA of the cervical spine and chest and therefore does not require an additional contrast bolus or radiation exposure.
III. Ultrasound or MRI imaging of the neck vessels is not recommended as a screening modality.

Consultation: A consult to the "Raleigh-Stroke Neurointerventionalist" team should be placed in Rapid Connect. The neurointerventional team is always available.

Treatment: To be determined in conjunction with the neurointerventional team. Treatment options include:

I. Antithrombotic therapy (anticoagulation or antiplatelet)

a. The optimal regimen is not known with respect to antithrombotic agent, duration of treatment, or endpoint of therapy.
b. Antithrombotic therapy may be limited by associated traumatic injuries.
c. Antithrombotic options include:
    i. ASA
    ii. Plavix
    iii. Direct oral anticoagulants
    iv. LMWH
    v. Heparin infusion

II. Surgery
    a. The vast majority of BCVIs occur in surgically inaccessible areas (e.g. skull base or transverse foramen). As such, surgical management is limited to high-grade surgically accessible lesions.

III. Endovascular stenting
    b. Endovascular stenting may be considered for grade II and III lesions. However, outcomes may not be improved compared to antithrombotic therapy alone. Contraindications to the immediate/periprocedural use of antithrombotic therapy may preclude stent use.

Follow-up care: To be determined in conjunction with the neurointerventional team.

I. Follow-up imaging
    a. There is significant evolution of BCVIs over time. As such, follow-up imaging (CTA or angiography) at or around 7 days post-injury is recommended.

II. Outpatient follow-up
    a. All patients should follow up with neurointerventional in 30-90 days.

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