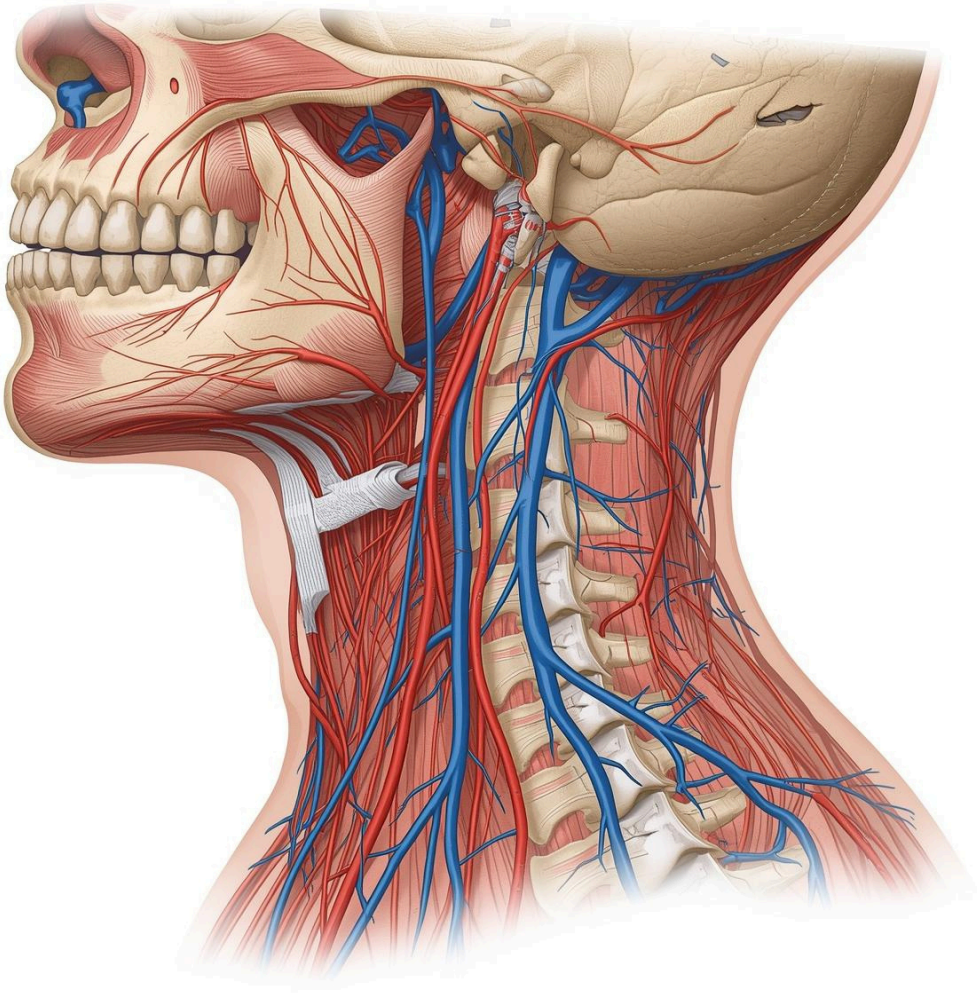
East Metropolitan Health Service

Royal Perth Hospital

Issue #27

The Trauma Bulletin



The Denver Criteria

In high risk trauma patients

Issue twenty seven

STATE ADULT TRAUMA SERVICE
WESTERN AUSTRALIA

Case summary

A young woman presented following a fall from a horse, landing forcefully on her helmeted head from an estimated height of approximately 1.6 metres. She did not lose consciousness, reported no immediate neurological symptoms, and was able to mobilise independently after the incident without difficulty or pain.

On arrival to the Emergency Department, her only complaint was moderate, generalised abdominal pain. She remained haemodynamically stable throughout her assessment. Abdominal examination revealed mild, diffuse tenderness without peritonism. There were no focal neurological deficits and no concerning cervical spine findings at the time of initial evaluation.

Given the mechanism of injury and abdominal symptoms, she underwent comprehensive trauma imaging. A CT trauma series demonstrated a Grade III liver laceration and an associated adrenal haematoma. No acute intracranial, cervical spine, or vascular injury was identified on the initial imaging set.

She was admitted to the surgical ward for non-operative management of the liver injury, with a structured plan including haemodynamic monitoring, serial abdominal examinations, and predefined escalation criteria should deterioration occur.

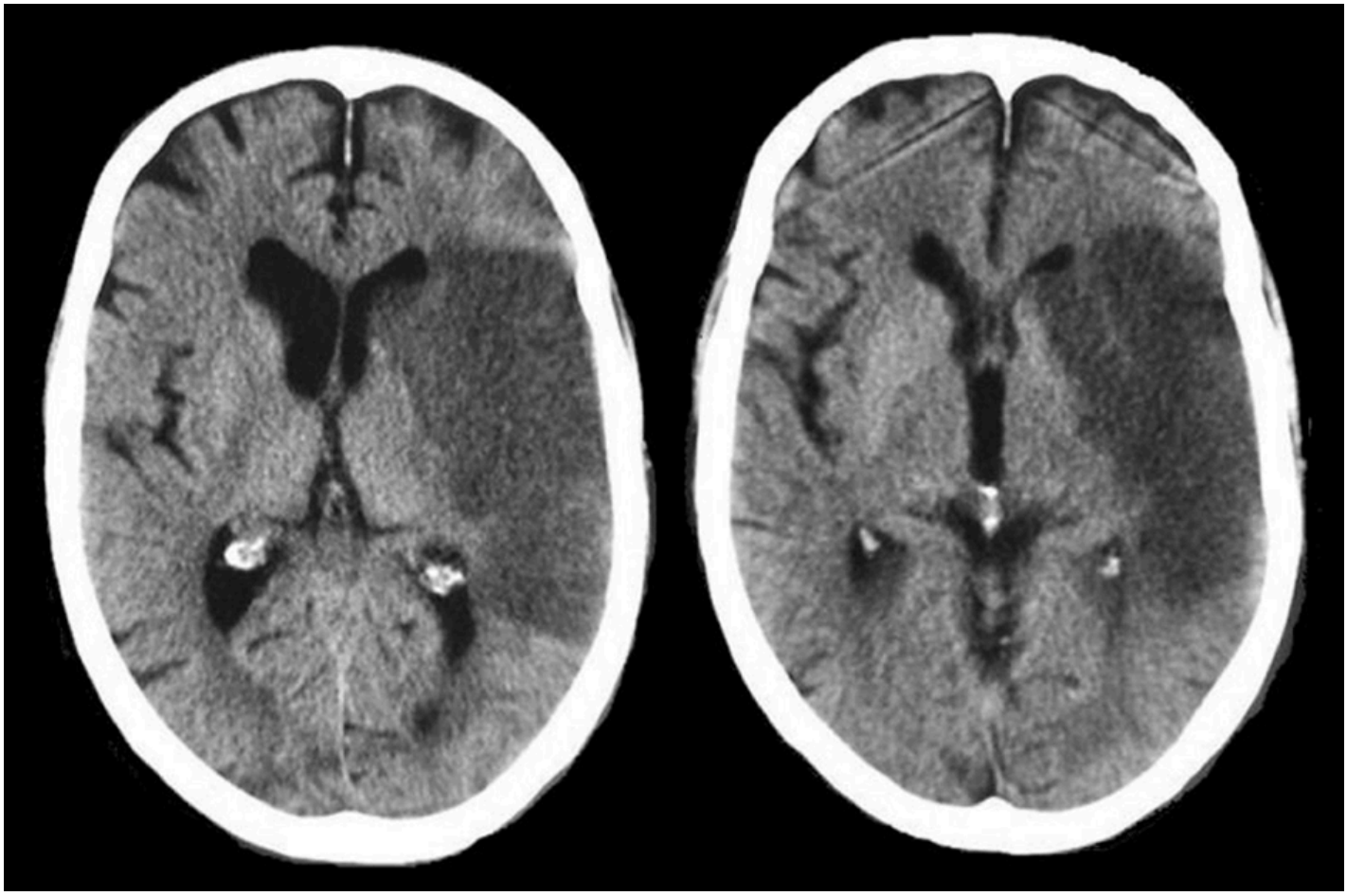
Later that evening, she developed new and severe left-sided neck and facial pain, accompanied by reduced vision in the left eye.

Complication

Approximately five days into admission, she suffered an abrupt neurological deterioration with a dense right hemiparesis, dysphasia, and a right homonymous hemianopia. A CT brain demonstrated a large left MCA territory infarct.

Further investigation with a CT angiogram of the carotid and vertebral arteries, confirmed a left internal carotid artery traumatic dissection, consistent with Blunt Cerebrovascular Injury (BCVI).

The CT scan



Clinical reflection

The central lesson is that blunt cerebrovascular injury is not merely a screen-at-the-door diagnosis; it is a condition that may declare itself over time. BCVI demands ongoing diagnostic vigilance. Evolving symptoms during admission. particularly when new, lateralising, or vascular in character, should prompt immediate reassessment and escalation. Once an ischaemic stroke is established, opportunities for neurological salvage are often limited; the window for prevention precedes the infarct.

Persistent unilateral neck or facial pain combined with visual disturbance, especially transient monocular vision loss or amaurosis fugax, are classic neurological symptoms of a cerebrovascular accident in the carotid arterial territory. These symptoms warrant serious consideration even in the absence of major facial fractures, high-grade cervical spine injury, or other traditional risk factors associated with BCVI. The absence of dramatic radiological findings at presentation should not falsely reassure the clinician when the clinical picture evolves.

Clinical reflection

In this patient's initial presentation, there were no clear indications under traditional screening criteria to mandate vascular imaging. However, contemporary practice continues a gradual shift towards more aggressive screening algorithms. As evidence has accumulated regarding missed injuries and preventable strokes, several authors and guidelines have advocated a lower threshold for CT angiography of the neck in blunt trauma. Some centres have even adopted universal screening protocols in major trauma cohorts.

Although this case may not have met classical or universal screening triggers, it sits precisely in the grey zone that underscores the importance of clinical judgement, symptom evolution, and readiness to revisit the diagnostic plan.

Discussion

This case encapsulates the fundamental challenge of blunt cerebrovascular injury: stroke is frequently preventable, but only if the vascular injury is identified before infarction occurs. The therapeutic window lies not in treating the completed stroke, but in recognising and managing the arterial injury early.

Contemporary best-practice recommendations therefore emphasise three pillars:

1. **CTA-based screening,** guided by expanded Denver criteria and clinical judgement
2. **Early multidisciplinary management**, once BCVI is confirmed and bleeding risk from other injuries is managed
3. **Structured follow-up imaging**, frequently in the first few days, and again at around 3 months, to assess healing, progression, or the need for escalation.

In operational terms, two complementary safety nets reduce missed BCVI:

- **Up-front screening** of patients who meet mechanism-based or clinical criteria.
- **Inpatient symptom-triggered escalation**, recognising that some patients will not meet screening thresholds at presentation yet subsequently declare themselves clinically.

Management Overview of Screen-Detected BCVI

Once BCVI is identified on CTA, management usually centres on early antithrombotic therapy, instituted as soon as bleeding risk (usually from other injuries) permits. The principal mechanism of stroke in BCVI is thromboembolism from the injured intima, and timely initiation of antiplatelet therapy or anticoagulation substantially reduces this risk. The choice of agent should be individualised, guided by injury grade, associated haemorrhagic burden, and multidisciplinary discussion (typically involving trauma surgery, neurointerventional radiology, vascular surgery, neurosurgery, and in cases where a stroke has occurred, neurology).

Endovascular options intervention are usually reserved for select cases, such as enlarging pseudoaneurysm, lesion progression, or recurrent embolic events despite appropriate medical therapy. In most patients, however, early detection and disciplined medical management remain the cornerstone of stroke prevention. Surgical repair is rarely indicated, and is usually reserved for damage-control and salvage strategies, in cases of active haemorrhage with open wounds and full thickness vascular rupture.

Injury grading informs surveillance and escalation. Lower-grade injuries frequently stabilise or heal with medical therapy alone, whereas higher-grade lesions, particularly pseudoaneurysms or occlusions, warrant closer monitoring. Repeat vascular imaging, tailored to the specific injury and patient. is commonly recommended to assess evolution, guide duration of therapy, and identify progression.

BCVI grading

- **Grade I** - Intimal irregularity or dissection with <25% luminal narrowing
- **Grade II** - Dissection/intramural haematoma with ≥25% narrowing
- **Grade III** - Pseudoaneurysm
- **Grade IV** - Occlusion
- **Grade V** - Transection with extravasation

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The Modified Denver Criteria

Signs and symptoms

- Potential arterial haemorrhage from the neck, nose or mouth
- Cervical bruit in patients <50 years of age
- Expanding cervical haematoma
- Focal neurologic deficit (transient ischaemic attach, hemiparesis, vertebrobasilar symptoms, Horner syndrome)
- Neurologic deficit incongruous with heat CT findings
- Stroke on CT or MRI

Risk factors

High energy transfer mechanism plus any of the following:

- Le Fort II or III displaced midface fracture
- Mandible fracture
- Complex skull fracture
- Base of skull fracture
- Scalp degloving
- C-spine fracture, subluxation, ligamentous injury at any level
- TBI with GCS <6
- Near hanging with hypoxic-ischaemic brain injury
- Clothesline type injury or seatbelt abrasion with swelling, pain or altered mental state
- TBI with thoracic injuries
- Upper rib fractures
- Thoracic vascular injuries
- Blunt cardiac rupture

American Association for the Surgery of Trauma–World Society of Emergency Surgery Guidelines on the diagnosis and management of cervical vascular injuries

https://journals.lww.com/jtrauma/fulltext/2026/03000/american_association_for_the_surgery_of.22.aspx

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