Bilateral blunt carotid artery injury: A case report and review of the literature

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We report a case of bilateral internal carotid artery (ICA) injury due to strangulation. At presentation there was no neurological deficit and the diagnosis was made on computed tomography (CT) angiography (CTA). The patient was managed conservatively with low-molecular-weight heparin (LMWH) anticoagulation and antiplatelet therapy, with no neurological sequelae. This approach merits consideration in carefully selected patients with such injuries.

Case report
A 22-year-old man had an accidental strangulation when a rope encircled his neck while he was riding a horse. At presentation he was haemodynamically stable with a Glasgow Coma Score of 15/15 and no focal neurological signs. The carotid pulses were palpable and equal with no bruits. He had neck crepitus and a non-expanding bilateral neck haematoma. A CT angiogram of the neck vessels (Fig. 1) showed total occlusion of the right ICA (grade IV injury) and a filling defect of the left ICA suggestive of an intimal flap (grade II injury). A CT scan of the brain showed no evidence of cerebral infarction. He was anticoagulated with LMWH and dual antiplatelet therapy with aspirin and clopidogrel and discharged 7 days after admission. At follow-up 1 month later he had no neurological sequelae, and a repeat CT angiogram (Fig. 2) showed resolution of the left ICA intimal flap with continued occlusion of the right ICA. Anticoagulation was stopped and he continued on dual antiplatelet therapy for a further 2 months.

Discussion
Blunt carotid artery injury (BCI) is rare, with a reported incidence of 0.33% in some series.10 Despite advances in imaging modalities and management options, the morbidity and mortality associated with BCI is over 30%, largely due to stroke.10 Bilateral injuries to the ICA are exceptionally rare, with experience limited to case reports only.11

A high index of suspicion is essential in detecting this often clinically occult injury. Biffel et al.12 have shown that aggressive screening using the Denver screening criteria (Table 1) to decide on the need for investigation12 has increased the detection rate for BCI from 0.1% to 0.86%. In addition, they showed an improvement in neurological outcome in asymptomatic BCI patients who were anticoagulated.

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Discussion
Blunt carotid artery injury (BCI) is rare, with a reported incidence of 0.33% in some series.[1] Despite advances in imaging modalities and management options, the morbidity and mortality associated with BCI is over 30%, largely due to stroke.[1] Bilateral injuries to the ICA are exceptionally rare, with experience limited to case reports only.[2] A high index of suspicion is essential in detecting this often clinically occult injury. Biffi et al.[3] have shown that aggressive screening using the Denver screening criteria (Table 1) to decide on the need for investigation has increased the detection rate for BCI from 0.1% to 0.86%. In addition, they showed an improvement in neurological outcome in asymptomatic BCI patients who were anticoagulated.

Biffi’s grading system based on investigative angiographic findings has management and prognostic implications outlined
Grade I and II injuries are of particular concern and require follow-up angiography owing to the risk of pseudoaneurysm formation despite heparin therapy.

Catheter-directed angiography remains the gold standard investigation for the diagnosis of BCI. CTA has delineated this injury adequately. Despite having a sensitivity of 50 - 68%, it is a popular diagnostic screening modality because of fast scanning times, and has the added benefit of excluding multiple injuries in the polytrauma patient. Magnetic resonance angiography (MRA) and CTA are equally sensitive in the detection of BCI. MRA has the advantage of detecting early cerebral ischaemia. Duplex scanning has a limited role owing to its inability to accurately assess the distal ICA above the angle of the mandible.

The management of BCI remains controversial without any level I evidence to support clinical guidelines. A beneficial effect of anticoagulation therapy with unfractionated heparin has been demonstrated, with a reduction of the ischaemic stroke rate from 29.8% to 3.9% in grade I - IV injuries. A small series by Wahl et al. showed a higher bleeding rate with heparin therapy compared with antiplatelet therapy, and the authors concluded that antiplatelet therapy should be used alone in patients at high risk of bleeding, especially with concomitant intracranial trauma.

The use of LMWH has not been described in the literature. With its excellent anticlotting properties and low bleeding complication profile, we believe that it may be the preferable anticoagulation method in these patients.

Open surgery still remains an option in the management of BCI and is indicated in patients with haemodynamic instability or neurological deterioration despite anticoagulation therapy, and in grade V injuries. Endovascular stenting is another option particularly useful for high extracranial ICA injuries and pseudoaneurysms where operative access is impossible.

Neither of these options was employed in our patient, as there was no neurological progression with his medical therapy.

REFERENCES

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Table 1. The Denver screening criteria for BCI

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Risk factors for BCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Arterial haemorrhage</td>
<td>High-energy transfer mechanism with:</td>
</tr>
<tr>
<td>- Cervical bruit in patient &lt;50 years of age</td>
<td>- LeForte II or III fracture</td>
</tr>
<tr>
<td>- Expanding cervical haematoma</td>
<td>- Cervical spine fracture</td>
</tr>
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<td>- Focal neurological deficit</td>
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<td>- Diffuse axonal injury with GCS &lt;6</td>
</tr>
<tr>
<td>- Stroke on secondary CT scan</td>
<td>- Near-hanging with anoxic brain injury</td>
</tr>
</tbody>
</table>

CT = computed tomography; BCI = blunt carotid injury; GCS = Glasgow Coma Score.

Table 2. Biffl grading system – relation of grade to prognosis and therapy

<table>
<thead>
<tr>
<th>Injury grade</th>
<th>Description</th>
<th>Stroke rate (%)</th>
<th>Mortality rate (%)</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Luminal irregularity or dissection with &lt;25% narrowing</td>
<td>3</td>
<td>11</td>
<td>Anticoagulation + carotid stenting (if progression of grade I/II injury/ enlarging pseudo-aneurysm)</td>
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<td>IV</td>
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<td>22</td>
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IV & Occlusion & 44 & 22 & Anticoagulation \\
\hline
V & Transection with free extravasation & 100 & 100 & Open repair \\
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\end{tabular}

Fig. 2. Follow-up computed tomography angiogram at 6 weeks, showing resolution of the left internal carotid artery intimal flap (open arrow) with persistent occlusion of the right ICA (white arrow).


