Unusual presentation of more common disease/injury

Blunt carotid injury from a penetrating stick: an unexpected injury

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Summary

Unattended blunt carotid injury (BCI) has stroke high risk of stroke and screening based on injury probability is recommended. Penetrating forces are not considered high risk and concomitant BCI would go unattended. The authors report a case of a 48-year-old man who fell out of a tree on to an upright stick that penetrated his lateral neck. He presented with impalement, which was removed after surgically laying open the entire wound. The carotid sheath had been breached and the internal jugular vein was bleeding. The adjacent common carotid artery was intact and pulsating with no external evidence of injury. However, injury proximity led to vascular imaging that demonstrated intimal disruption without thrombus or stenosis. Although he remained asymptomatic on heparin, the injury progressed to cause significant lumen stenosis. Endovascular stenting re-established the vessel lumen and he remains well on aspirin 9 months later. Awareness that penetrating neck trauma may cause BCIs is important.

BACKGROUND

Blunt carotid injury (BCI), though less common than penetrating injury, is extremely important because of its propensity to cause cerebral infarction in approximately 25% of those affected unless appropriate treatment is started early.¹ Early suspicion of BCI is based on high-risk injury mechanism and associated cranio-mandibular-cervical fractures in order to proceed with pre-clinical confirmation and early treatment.²

A motor vehicle crash or direct blow to the head and neck are high-risk incidents for BCI and involves the internal carotid artery (ICA). The injury mechanism, cervical hyperextension-rotation, leads to compression and stretching of the ICA over a transverse process of any of the upper three cervical vertebrae or compression between the mandible and spine.³

In contrast, penetrating injury to the neck would not be considered a marker for BCI. We report a case of penetrating trauma to the neck that caused a BCI.

CASE PRESENTATION

A 48-year-old man sustained a penetrating injury to the right side of his neck (zone I) when he fell 4 m off a tree on to an upright stick, which pierced into his right posterolateral neck. He was brought to hospital with the stick in situ (figure 1A). There was neither overt bleeding nor haematoma in the neck. He was conscious, rational and without neurological deficits. There was no airway or haemodynamic compromise at any point. There were no other injuries. Cervical fractures were excluded radiologically.

The management goal was to remove the impaled stick without uncontrolled bleeding from vascular structures in its path that may have been tamponaded by its presence. Thus, the wound was explored in the operating theatre under general anaesthesia with extension of the wound edges. The

stick was removed under direct vision (figure 1B). The carotid sheath had been breached and the bleeding right internal jugular vein (IJV) was ligated. The adjacent common carotid artery (CCA) was intact, not bleeding and pulsating throughout its length. However, the possibility of BCI was considered due to the close proximity of injury to

Figure 1 (A) Impaled stick with indrawn clothing at the root of the neck. (B) Stick removed at surgery.

the CCA, but this required confirmation. The wound was washed thoroughly and closed primarily.

INVESTIGATIONS

Post-surgical CT angiography (CTA) revealed wall irregularity and lumen indentation suggestive of disrupted intima in the right CCA. There were no lumen filling defects, stenosis or pseudoaneurysm formation (figure 2).

TREATMENT

Having confirmed intimal disruption in the CCA, the patient was anticoagulated with low molecular weight heparin to prevent cerebral thromboembolism. Although he remained well and neurologically unaffected, follow-up imaging 10 days later revealed an intra-arterial filling defect suggestive of thrombus and significant lumen stenosis (figure 3). Progression of intimal injury despite anticoagulation and increased risk of cerebral thromboembolism led to definitive management of the injury site with the deployment of an 8 mm diameter, 50 mm long, Gore Viabahn, nitinol-reinforced expanded polytetrafluoroethylene stent graft (figure 4). Long term, aspirin was given to protect the stent.

OUTCOME AND FOLLOW-UP

Nine months later he remains well, neurologically unaffected and has a patent stent in position confirmed by Doppler.

DISCUSSION

Penetration of the neck with a stick is a rare phenomenon and non-penetrating injury to the CCA that lies in its path is unexpected. The main concern in our patient was not BCI, but that the impaled stick would tamponade disrupted vessels with the potential for serious haemorrhage after its removal. The possibility of BCI was considered only when a breach of the carotid sheath with a tear in the adjacent IJV was observed at wound exploration.

Figure 2 Screening CT angiogram demonstrating wall irregularity and lumen indentation suggestive of disrupted intima in the right common carotid artery. The adjacent internal jugular vein is interrupted by ligature.

The only report in the literature of a BCI by a penetrating force is that of stabbing by a sharp knife.⁴ In that instance, the injury was in the ICA well away from the stab wound and probably unrelated to the penetrating force. The authors hypothesise that their patient may have sustained the BCI because the assailant hyper-extended his neck and rotated the head for greater access to the neck when inflicting the stab wounds.⁴ Similar neck movements might have occurred in our patient from the moment his neck was pierced by the stick. But the injury in our patient being in the CCA rather than the ICA points to a different mechanism. We suspect that the CCA was directly struck by the penetrating stick. The elasticity and mobility of the artery would have resulted in it sliding away from a penetrating force. The relatively blunt end of the stick would have been another factor protecting the artery from being penetrated. However, the resultant overstretching and rotation of the CCA could explain the observed injury. In contrast the adjacent IJV, being non-turgid, inelastic and relatively fixed by its tributaries, would not slide away from such penetrating force and, thus, be torn.

Figure 3 Follow up contrast angiography demonstrating deficient lumen filling and significant stenosis in the common carotid artery indicating thrombus and injury progression.

Figure 4 Stented common carotid artery injury with correction of stenosis.

Screening for internal injuries following penetrating trauma to the neck is by clinical means^{5 6} and CT is recommended only for clinically apparent injuries prior to surgical exploration.^{6 7} Thus, in our patient, there was no indication for diagnostic CT but surgical exploration was necessary because of impalement.

In contrast, BCI is initially asymptomatic and screening is by imaging. Imaging techniques to screen for BCI continue to evolve. Less invasive multidetector CTA with intravenous contrast is fast replacing traditional percutaneous transfemoral contrast angiography as the method of choice in screening for BCI.²

An injury grading scale based on angiographic appearance is used to prognosticate and guide treatment in BCI.³ Grade I injuries are those with lumen wall irregularity, implying intimal damage alone, which is the type of lesion our patient presented with. Our patient was anticoagulated based on the evidence that it prevents neurological deficits in the asymptomatic and improves neurological outcomes in those with neurological deficits.^{1 8} Nevertheless, injury

progression is common and stroke risk increased at 7–10 days and, thus, follow-up imaging is recommended.⁹ This was the case with our patient where the injury had progressed to cause severe stenosis with intra-arterial thrombosis.

There is no reliable evidence on the best mode of treatment for such flow-limiting lesions. As the BCI was in the zone I–II junction, surgical accessibility of the proximal CCA for clamping would be challenging. Endovascular stenting seemed more appropriate in this instance. Furthermore, the distal end of injury was 3 cm proximal to the carotid bifurcation providing adequate length for landing.

Published reports of endovascular stenting for traumatic carotid injuries remain sporadic and confined to case reports and case series. Early results are encouraging, but experience with this modality and data on long-term follow-up is still very limited.¹⁰ A large prospective randomised trial is warranted to further define the role of this treatment modality in the setting of trauma.

Learning points

- ▶ Combined penetrating and blunt injuries from the same penetrating object is possible.
- ▶ A penetrating injury of the neck diverts attention away from possible BCI.
- ▶ Awareness of the possibility of BCI, even in the presence of obvious penetrating neck injury, can improve care and outcome.
- ▶ Beware of injury progression despite anticoagulation.
- ▶ Endovascular stenting is feasible and arrests BCI progression.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Stein DM**, Boswell S, Sliker CW, *et al*. Blunt cerebrovascular injuries: does treatment always matter? *J Trauma* 2009;**66**:132–43.
2. **Berne JD**, Cook A, Rowe SA, *et al*. A multivariate logistic regression analysis of risk factors for blunt cerebrovascular injury. *J Vasc Surg* 2010;**51**:57–64.
3. **Biffi WL**, Moore EE, Offner PJ, *et al*. Blunt carotid arterial injuries: implications of a new grading scale. *J Trauma* 1999;**47**:845–53.
4. **Rossie J**. A tale of two mechanisms: blunt carotid artery injury in a stabbing victim. *J Emerg Nurs* 2009;**35**:386–8.
5. **Nason RW**, Assuras GN, Gray PR, *et al*. Penetrating neck injuries: analysis of experience from a Canadian trauma centre. *Can J Surg* 2001;**44**:122–6.
6. **Gonzalez RP**, Falimirski M, Holevar MR, *et al*. Penetrating zone II neck injury: does dynamic computed tomographic scan contribute to the diagnostic sensitivity of physical examination for surgically significant injury? A prospective blinded study. *J Trauma* 2003;**54**:61–4.
7. **Bell RB**, Osborn T, Dierks EJ, *et al*. Management of penetrating neck injuries: a new paradigm for civilian trauma. *J Oral Maxillofac Surg* 2007;**65**:691–705.
8. **Cothren CC**, Moore EE, Biffi WL, *et al*. Anticoagulation is the gold standard therapy for blunt carotid injuries to reduce stroke rate. *Arch Surg* 2004;**139**:540–5.
9. **Biffi WL**, Ray CE Jr, Moore EE, *et al*. Treatment-related outcomes from blunt cerebrovascular injuries: importance of routine follow-up arteriography. *Ann Surg* 2002;**235**:699–706.
10. **DuBose J**, Recinos G, Teixeira PG, *et al*. Endovascular stenting for the treatment of traumatic internal carotid injuries: expanding experience. *J Trauma* 2008;**65**:1561–6.

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