Survival with intact cerebral function after gunshot injury to both internal carotid arteries

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A 24-year-old man was admitted after sustaining a single gunshot wound to the neck with an expanding hematoma on the left. Computed tomography angiography demonstrated bilateral internal carotid artery pseudoaneurysms, with disruption of flow on the left and a carotid-jugular fistula on the right. At operation, transection of the left internal carotid artery necessitated ligation of the artery. No injuries to the trachea or larynx were found, but the pharynx was lacerated and was repaired. The patient was transferred to the angiography suite where a stent graft was placed in the right internal carotid artery. This served to close the pseudoaneurysm and the arteriovenous fistula while preserving distal flow. The patient recovered with intact cerebral function and with mild paresis of the tongue related to hypoglossal nerve injury. He was discharged home after 7 days. (J Vasc Surg 2005;42:567-9.)

Gunshot wounds of the internal carotid artery are associated with a mortality rate of 18.4%, largely related to stroke.1 Although bilateral internal carotid blunt injuries and dissections have been reported, we are not aware of a report on successful management of bilateral gunshot injury of the internal carotid arteries.2 We report here on such a case, which required emergent operative and endovascular treatment.

CASE REPORT

A 24-year-old man was admitted to the hospital shortly after sustaining a single gunshot wound to the neck, apparently from the right. He was intubated in the field and arrived at the hospital with a Glasgow coma score of 3. There were two wounds in zone 1 of the neck, on both sides, and an expanding hematoma on the left.

Because of the transverse course of the bullet and suspicion of bilateral carotid injury, a computed tomography (CT) scan was expeditiously obtained. The scan demonstrated a pseudoaneurysm arising from the left internal carotid artery about 2 cm from its origin, without filling of the artery distally. On the right, a pseudoaneurysm arose from the right internal carotid artery at a similar level. On this side, continuity of the carotid artery was maintained, and a carotid-jugular fistula was evident (Fig 1).

The patient was taken to the operating room where, under exploration of the left side of the neck, a large, tense hematoma was evacuated. There was complete disruption of the internal carotid artery as well as complete disruption of the internal jugular vein. The proximity of the distal carotid stump to the skull base and the degree of injury was such that to control the bleeding, the internal carotid artery and the internal jugular vein had to be ligated.

There was no active bleeding or swelling on the right side of the neck. Because right carotid clamping, even for a brief period, was undesirable, it was decided to proceed with endovascular repair of the right internal carotid artery. On exploration and esophagoscopy, no injury to the larynx or trachea was identified,
and a laceration in the pharynx was sutured. In view of the extensive bilateral injury and in anticipation of laryngeal edema, a tracheostomy tube was placed.

The patient was taken to the angiography suite where transfemoral angiography demonstrated the site of the injury to the right internal carotid artery and the carotid-jugular fistula (Fig 2). A Jostent stent graft (Abbott Laboratories, Abbott Park, Illinois) (Jograft, 28 × 4-9 mm) was placed in the internal carotid artery and expanded to 6 mm (Fig 3). Completion cerebral angiography demonstrated cross-filling of the left cerebral vessels from the right (Fig 4).

After the procedure, the patient regained consciousness without any evident cerebral deficit. On neurologic examination, mild paresis of the left side of the tongue was found, apparently related to traumatic or surgical left hypoglossal nerve injury. In addition, an abnormality in swallowing, most probably related to sensory loss due to left superior laryngeal nerve injury, was diagnosed. The vocal cords were normal, and the patient was able to speak and eat normally. He was discharged home on the seventh postoperative day in good general condition.

DISCUSSION

Injuries of the internal carotid artery are less frequent than common carotid artery injuries but are associated with a higher mortality (18% to 21%) and higher stroke rate (41%). High extracranial internal carotid artery injury may be surgically challenging and occasionally requires ligation to prevent exsanguination. When this is done, stroke and mortality rates are even higher. High cervical carotid injuries have been treated with carotid-petrous bypass or...
with extracranial-intracranial bypass on occasion, but these techniques are not generally applicable.6

Over the last decade, the endovascular treatment of arterial trauma with stent grafts has emerged as an acceptable alternative to surgical repair in cases of internal carotid pseudoaneurysm and arteriovenous fistula.7-9 This approach is especially appealing in injuries that are difficult to access surgically because of location or because of previous surgery or irradiation.10 Bilateral internal carotid injuries are uncommon and clearly pose an even greater challenge than unilateral injury. In the case presented, ligation on one side made contralateral clamping for surgical repair undesirable, and because there was no active bleeding, endovascular repair was preferred.

A balloon-expandable stent graft was used because it was the one available to us at the time. There have been reports of crushed balloon-expandable stents in the neck and therefore self-expanding stents are considered preferable,11 although Jostent use at this location has been reported.12 In conclusion, combination of surgical ligation of a disrupted right internal carotid artery and endovascular repair of the left internal carotid artery enabled us to achieve recovery with intact cerebral function.

REFERENCES

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