CASE REPORT

Facial and neck hematoma after carotid artery stenting: an uncommon misadventure in endovascular carotid revascularization

Ramesh Grandhi, Abhiram Gande, Nathan Thomas Zwagerman, Brian Thomas Jankowitz

Department of Neurological Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

Correspondence to

Dr B T Jankowitz, Department of Neurological Surgery, University of Pittsburgh Medical Center, 350 Locust Street, Suite 300, MPOB, Pittsburgh, PA 15219, USA; jankbt@upmc.edu

SUMMARY

The complication rates of carotid artery stenting (CAS) vary from 3.0% to 4.4%, and most commonly include ischemic stroke, intracranial hemorrhage, or groin complications. We present the rare complication of a patient who underwent CAS for a symptomatic 90% left internal carotid artery stenosis and developed an expanding cervical hematoma after the procedure with imminent respiratory compromise. After intubation, an arteriogram revealed perforation of the external carotid artery trunk, proximal to the origin of the internal maxillary artery. The artery was subsequently embolized and the hematoma resolved without further intervention. We present a potential catastrophic complication and suggest potential causes and treatment options available.

BACKGROUND

An expanding neck hematoma after carotid artery stenting (CAS) is a potentially fatal complication that may arise during the procedure.^{1–3} We present our unusual case of a late hematoma arising after treatment, and emphasize the importance of post-operative care and examination of this unusual complication.

CASE PRESENTATION

A right-handed woman with a past medical history significant for myocardial infarction, right carotid endarterectomy, dyslipidemia, and cigarette smoking presented after a transient ischemic attack characterized by transient aphasia and right hemiparesis. On initial evaluation, she was neurologically intact with an unremarkable non-contrasted CT head and MRI. CT angiography of her head and neck demonstrated proximal left internal carotid artery (ICA) stenosis of greater than 70%, with an associated tandem lesion in the left cavernous ICA, and a proximal right ICA stenosis of 80%.

The patient underwent a catheter based arteriogram, which revealed 90% stenosis of the proximal left ICA (figure 1). After deciding to proceed with CAS, two 300 cm V-18 ControlWires (Boston Scientific, Natick, Massachusetts, USA) were advanced into the distal external carotid artery (ECA), and the diagnostic catheter was exchanged for a 90 cm 6 F Cook shuttle guide sheath (Shuttle-SL; Cook Medical, Bloomington, Indiana, USA). CAS was performed with a 6×20 mm Precise stent (Cordis

Corporation, Bridgewater, New Jersey, USA) and a 5.0 mm SpiderFX distal protection device (Covidien, Irvine, California, USA) under local anesthesia with intravenous sedation. Aspirin 325 mg and clopidogrel 75 mg had been administered pre-procedurally, and intravenous heparin was given during the stenting procedure. The highest recorded activated clotting time was 287 s. Pre- and post-stenting angioplasty was performed using a 3×15 mm TREK dilatation catheter (Abbott Laboratories, Abbott Park, Illinois, USA) and a 5×20 mm Viatrac 14 Plus peripheral dilatation catheter (Abbott Laboratories), respectively. Heparin was not reversed. No complications were noted.

Shortly after her arrival to the intensive care unit, the patient complained of left jaw, neck, and upper chest pain. A cardiac etiology of her complaints was immediately investigated and ruled out. Over the next 6 h, increasing left facial and lateral neck swelling were observed.

INVESTIGATIONS

Due to concern for respiratory compromise, she was intubated and emergently taken for a repeat angiogram. Other etiologies, including angioedema, were considered but given the recent procedure and clinical presentation, a repeat conventional angiogram was performed in place of a CT or CT

Figure 1 Catheterization of the left common carotid artery (lateral view), showing proximal internal carotid artery stenosis of 90%.

To cite: Grandhi R, Gande A, Zwagerman NT, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-010774

Figure 2 Repeat arteriography (lateral view) obtained following the development of the expanding facial and neck hematoma depicts contrast extravasation (arrows) from the external carotid artery trunk in the (A) early and (B) late arterial phases.

angiography of the neck in the event that an intervention would be required.

TREATMENT

The repeat arteriogram revealed contrast extravasation from the distal left ECA (figure 2A, B). A Rapid Transit microcatheter (Codman and Shurtleff Inc, Raynham, Massachusetts, USA) was advanced into the superficial temporal artery, distal to the ECA perforation site, and the superficial temporal artery and distal ECA were retrograde embolized down to the proximal ECA with 3/2 Tornado coils (Cook Medical Inc) (figure 3).

OUTCOME AND FOLLOW-UP

The patient was returned to the ICU and extubated the following morning. Her facial and neck swelling improved significantly

by the next evening, and the patient was discharged home on post procedure day 2.

DISCUSSION

A Cochrane review of more than 5000 CAS procedures determined the periprocedural risk of stroke or death following CAS as 4.7% (range 2–9%).⁴ Thromboembolic events, estimated at a rate between 4.1% and 6.5% from recent randomized controlled trials, represent the most common complications associated with CAS.^{1–5} Other relatively common complications of CAS include carotid artery spasm, carotid artery dissection, and symptomatic bradycardia with hypotension due to carotid sinus irritation during angioplasty.^{6–8} Perforations of branches of the external carotid or superficial temporal arteries following ICA stent placement have only been discussed once in the extant literature.⁹

While exceedingly uncommon, an iatrogenic perforation of a branch of the ECA is a life threatening complication of endovascular carotid revascularization procedures, and may occur secondary to wires or catheters being manipulated in these small vessels. Typically, wires are used for exchange of diagnostic catheters to shuttle sheaths in the ECA and/or its branches. This maneuver functions as a safety measure against crossing the symptomatic ICA lesion and risking a cerebral embolic event. While some operators prefer to use 0.035/0.038 inch Amplatz Extra-Stiff wires (Cook Medical) during catheter exchanges, our decision to use V-18 ControlWires was based on the latter being easier to control and anchor in the distal vasculature, thus preventing loss of wire access. Regardless, the operator must be aware of the shape of the wire tip when accessing these distal vessels to avoid an arterial perforation.

In a case series from the University of Buffalo, the authors reported only four instances of vessel perforation in more than 1000 CAS cases.⁹ In three of the cases, the complications occurred due to wire perforations of the facial, lingual, and occipital arteries, while in the fourth case the cause of the vessel perforation was the result of a predilatation balloon being inflated in the ascending pharyngeal artery. In two of the three instances in which wire perforations occurred, stiff exchange wires were used, and in the other, a Glidewire (Terumo Medical Corp, Somerset, New Jersey, USA) was used. In all of the cases, vessel perforation was discovered during the case, based on

Figure 3 Native angiographic image (lateral view) of the left common carotid artery after coil embolization of the external carotid artery.

angiography or a change in the patient's status, which argues for performing CAS under local anesthesia with minimal intravenous sedation, unless contraindicated.

Although we had a delay in correctly identifying the etiology of our patient's complaints of jaw and neck pain, the findings of facial and neck swelling allowed us to surmise that a perforation of the ECA had likely occurred. Expedient management of her airway was key, followed by repeat arteriography and treatment of the affected artery. As noted by Ecker *et al*, the expanding hematoma can tamponade further extravasation of blood from the damaged vessel and obviate the need for embolizing the perforated vessel. However, in the case described herein, a late contrast blush was seen arising from the distal ECA after selective angiography, indicating a hemorrhage rate of at least 3 mL/min.¹⁰ Thus our decision to embolize the perforated artery was due to findings of persistent hemorrhage on the repeat arteriogram obtained several hours after the initial CAS procedure. The internal maxillary artery was not embolized as this artery was not believed to have been perforated based on the angiogram which showed contrast extravasation from the ECA trunk. A significant portion of the ECA was embolized rather than just the segment of perforation because (a) doing so would prevent any potential further bleeding from angiographically occult collaterals and (b) our use of tornado coils (Cook Medical Inc) which, in our experience with oropharyngeal bleeds and epistaxis can be rapidly deployed but require a fairly large number to be used. There are other treatment methods that could have been used but given the emergent nature of the case, we chose the most efficacious and rapid manner possible based on experience.

Learning points

- Expanding neck hematoma is a potential complication of carotid artery stenting.
- This is a potentially lethal problem.
- Prompt diagnosis and treatment is essential.
- Postoperative evaluation and physical examination is vital to the treatment of the postoperative patient.
- Endovascular embolization of the hemorrhaging vessel is a safe treatment option.

Contributors RG wrote the bulk of the manuscript. NTZ prepared the discussion, and contributed to data gathering and research. AG performed the article editing, formatting, and research. BTJ was the overseeing staff, responsible for oversight and direction.

Competing interests None.

Patient consent Obtained.

Ethics approval The study was approved by the institutional review board.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Brott TG, Hobson RW II, Howard G, *et al*. Stenting versus endarterectomy for treatment of carotid-artery stenosis. *N Engl J Med* 2010;363:11–23.
- 2 Taha MM, Sakaida H, Asakura F, *et al*. Access site complications with carotid angioplasty and stenting. *Surg Neurol* 2007;68:431–7.
- 3 McDonald RJ, Cloft HJ, Kallmes DF. Intracranial hemorrhage is much more common after carotid stenting than after endarterectomy: evidence from the National Inpatient Sample. *Stroke* 2011;42:2782–7.
- 4 Coward LJ, Featherstone RL, Brown MM. Safety and efficacy of endovascular treatment of carotid artery stenosis compared with carotid endarterectomy: a Cochrane systematic review of the randomized evidence. *Stroke* 2005;36:905–11.
- 5 Ringleb PA, Allenberg J, Bruckmann H, *et al*. 30 day results from the SPACE trial of stent-protected angioplasty versus carotid endarterectomy in symptomatic patients: a randomised non-inferiority trial. *Lancet* 2006;368:1239–47.
- 6 Bonati LH, Engelter ST, Lyrer PA. Carotid artery stenting. *Swiss Med Wkly* 2012;142:w13619.
- 7 Erickson K, Cole D. Carotid artery disease: stenting vs endarterectomy. *Br J Anaesth* 2010;105(Suppl 1):i34–49.
- 8 Theron JG, Payelle GG, Coskun O, *et al*. Carotid artery stenosis: treatment with protected balloon angioplasty and stent placement. *Radiology* 1996;201:627–36.
- 9 Ecker RD, Guidot CA, Hanel RA, *et al*. Perforation of external carotid artery branch arteries during endoluminal carotid revascularization procedures: consequences and management. *J Invasive Cardiol* 2005;17:292–5.
- 10 Beriljung L, Hjorth S, Svendler CA, *et al*. Angiography in acute gastrointestinal bleeding. *Surg Gynecol Obstet* 1977;145:501–3.

Copyright 2013 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow