CASE REPORT

Treatment of hemorrhagic head and neck lesions by direct puncture and nBCA embolization

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ABSTRACT

Life-threatening bleeding in the head and neck region requires urgent management. These hemorrhagic lesions, for example, a ruptured pseudoaneurysm, are often treated by transarterial embolization (TAE), but prior intervention or surgery, inflammation, anatomic variants, and vessel tortuosity may render an endovascular approach challenging, time-consuming, and sometimes impossible. We report two cases of severe head and neck hemorrhages successfully embolized with *n*-butyl cyanoacrylate via direct puncture, and propose this approach as a fast, safe, and effective alternative to TAE.

BACKGROUND

Approximately 10% of patients with head and neck neoplasia develop hemorrhagic complications, including pseudoaneurysm formation, tumorous ulceration, or secondary effects of chemoradiation therapy. Pseudoaneurysms may be induced by inflammation, neoplastic extension, or iatrogenic injury, and cause life-threatening hemorrhage difficult to manage with traditional surgical techniques.¹ Pseudoaneurysms of the external carotid artery and its branches are relatively rare and lesions involving the lingual artery being are especially uncommon.² Transarterial embolization (TAE) is now the first-line treatment method for ruptured pseudoaneurysms.³

Direct puncture embolization has been previously described as an alternative to TAE^{4,5}; however, the use of *n*-butyl cyanoacrylate (nBCA, TRUFILL, Codman Neurovascular, Raynham, Massachusetts, USA) has not been reported for the treatment of hemorrhagic head and neck lesions.

CASE PRESENTATION**Case presentation 1**

A middle-aged individual with recurrent squamous cell carcinoma of the tongue and mouth managed with surgical resection and adjuvant radiotherapy presented to the emergency department with life-threatening hematemesis. Angiography revealed a 6 mm pseudoaneurysm of the proximal right internal carotid artery (ICA) with active contrast extravasation, successfully treated with two covered stents extending across the origin of the external carotid artery (Atrium ICAST, Atrium Medical, Hudson, New Hampshire, USA (6×16 and 6×38 mm)). Final angiography showed no active contrast extravasation, with patent right common and ICAs (figure 1).

The patient recovered and was discharged to home, but returned 3 months later with severe recurrent hematemesis. Angiography revealed occlusion of the previously placed carotid stents. The trunk of the ECA, which was now only opacified by vertebral injections via multiple small collateral channels, was ruptured, with significant contrast extravasation. Given the right common carotid artery occlusion no transarterial access to the ECA trunk, direct puncture was performed under fluoroscopic control. Under roadmap guidance provided by a right vertebral injection, a 21 G needle was advanced percutaneously into the ECA trunk, near the site of extravasation. Angiography performed via the needle confirmed adequate positioning and

Figure 1 A middle-aged patient with external carotid rupture (case 1). Lateral view from a right vertebral angiogram (A) shows collateral supply to the right external carotid artery with active contrast extravasation (arrows). Under roadmap guidance provided by the right vertebral artery injection (B, C), a 21 G needle (arrows) was advanced percutaneously into the right external carotid artery near the site of extravasation. Non-subtracted images demonstrate the site of direct puncture as well as the previously placed, now occluded right common/internal carotid artery stent. Postembolization angiography (D) confirmed the absence of residual extravasation.

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Figure 2 A 65-year-old patient with lingual artery pseudoaneurysm (case 2) (PA) (A) and lateral (B) views from a left common carotid artery angiogram prior to embolization demonstrate minute sublingual branches extending across the midline to join small right terminal lingual artery branches with persistent supply to the right-sided PA (black arrows). A 21 G micropuncture needle (white arrows) was placed in the PA (black arrows) and adequate positioning confirmed by angiography (C, D), which also demonstrated persistent extravasation. Final control angiography via the left common carotid artery (E, F) after embolization documents obliteration of the PA by the *n*-butyl cyanoacrylate cast (black arrows). The PA (white arrow) is difficult to prospectively identify on coronal (G) and sagittal (H) CTA reformatted images.

the ruptured ECA was embolized under negative roadmap guidance with nBCA using a 1:3 (nBCA:Ethiodol) ratio after flushing the needle and tubing with D5. The technique and rate of injection is similar to transarterial glue embolization; however, the nBCA appears sooner due to the shorter tubing attached to the needle versus a standard 150 cm microcatheter. The embolization was continued until the pseudoaneurysm was filled with glue. Control angiography after glue embolization confirmed no residual contrast extravasation. The patient recovered and was discharged home a few days later.

Case presentation 2

A 65-year-old woman with squamous cell carcinoma of the tongue presented with life-threatening hematemesis shortly after lingual tonsillectomy. Oropharyngeal packing initially achieved hemostasis, but heavy bleeding resumed during unpacking, suggesting an oropharyngeal source, which could neither be identified by laryngoscopy nor by direct visualization in the operating room. Angiography demonstrated a 5 mm right lingual artery pseudoaneurysm (figure 2).

The proximal segment of the lingual artery was markedly irregular, likely from tumorous involvement. Initial attempts to navigate the microcatheter beyond the irregular segment were unsuccessful, and the branch was embolized from a proximal position with nBCA. Control right ECA angiography showed no residual flow to the pseudoaneurysm, but selective left lingual artery angiography revealed a small sublingual branch extending across the midline to supply the pseudoaneurysm. The left lingual artery was not embolized in order to preserve the tongue vascularization. Conservative management was attempted by keeping the patient intubated

and sedated with packing in place to facilitate thrombosis of the pseudoaneurysm. The patient was extubated after 3 days, but a new hemorrhage warranted repeat angiography.

The right lingual pseudoaneurysm remained supplied via minute left-to-right anastomotic branches; the lesion was therefore embolized by direct puncture. A 21 G needle was advanced into the pseudoaneurysm under fluoroscopic guidance. Angiography via the needle opacified the right lingual pseudoaneurysm and showed contrast extravasation. Embolization was performed with nBCA using the technique described in case 1. Control angiography confirmed obliteration of the pseudoaneurysm and patency of the left lingual branches. The patient tolerated the procedure well and did not suffer additional bleeding episodes.

DISCUSSION

Therapeutic options for ruptured pseudoaneurysms include conservative surveillance, compression, catheter-based embolization, and surgical resection.^{6,7} TAE has proven to be a safe and effective alternative to surgery in the head and neck region. A more selective and less invasive option, TAE has helped to reduce morbidity and mortality rates in these typically fragile patients.^{1,8} However, complications remain a concern, including embolic events leading to temporary or permanent neurological damage as well as tissue necrosis, infection, and iatrogenic vessel dissection.¹ Multiple embolization attempts are sometimes necessary to achieve complete hemostasis, especially in patients who underwent prior surgery and/or chemoradiation.

Direct percutaneous treatment of peripheral and visceral pseudoaneurysms—first reported in 1986 for a common iliac artery pseudoaneurysm⁵—is a useful alternative to TAE.^{4,5} In

addition, nBCA offers rapid permanent occlusion compared with coils or thrombin, and constitutes an ideal complement to the fast access provided by direct puncture. The ability of fine-tuning the polymerization time by adjusting the nBCA to iodized oil ratio offers excellent control over the procedure, notably in regard to the desired depth of embolic agent penetration. While there is a risk of nontarget embolization with using a liquid embolic agent, the direct puncture route is not of any higher risk than standard TAE techniques. Real-time biplane fluoroscopic visualization of the embolic agent during embolization is essential for minimizing this risk. Another risk to consider is infection, which can be minimized by prepping the area prior to direct puncture and using standard sterile technique. Our two cases demonstrate the safety and efficacy of direct puncture nBCA embolization for oropharyngeal pseudoaneurysms. We believe this technique to be ideally suited to the immediate control of acute life-threatening hemorrhagic episodes occurring in the head and neck region.

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