Embolization and sclerotherapy for head and neck arteriovenous malformations with uncontrollable torrential bleeding

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ABSTRACT

Torrential bleeding is a rare and life-threatening complication of arteriovenous malformations (AVMs). We report a case of head and neck AVMs present with uncontrollable torrential bleeding, which was treated with embolization and sclerotherapy. Then we explored the potential multidisciplinary handling of the procedure for this kind of case. A 25-year-old female patient was born with right face and head AVMs. The AVMs had grown gradually and ruptured spontaneously with uncontrollable torrential bleeding before admission. Emergent direct hemostasis, nasotracheal intubation, and staged embolization and sclerotherapy were carried out on this patient. Finally, the bleeding stopped and the wound healed successfully. Embolization and sclerotherapy are effective for head and neck AVMs with uncontrollable torrential bleeding. Multidisciplinary collaboration is needed to achieve a good outcome. (J Vasc Surg Cases Innov Tech 2024;10:101597.)

Keywords: Embolo/sclerotherapy; Head and neck arteriovenous malformations; Uncontrollable torrentially bleeding; Multidisciplinary collaboration; Vascular anomaly

Arteriovenous malformations (AVMs) are a kind of vascular anomalies characterized by direct communication between primitive reticular networks of dysplastic vessels and high-velocity blood shunting from the arterial side to the low-resistance venous side.[1] Owing to the high blood flow velocity and volume, AVMs seem to be more aggressive than other type of vascular anomalies and are associated with more limb- or life-threatening complications.[2-4]

AVMs affect various parts of the body; the head and neck are the most commonly involved regions.[5] It is usually hard to achieve complete cure for head and neck AVMs; the primary goal of treatment is to prevent life-threatening bleeding. However, AVM rupture is sometimes unavoidable because of the progressive and aggressive nature. In these ruptured cases, uncontrollable torrential bleeding, subsequent local infection, and airway edema are intractable.

We report a case with diffuse head and neck AVMs, presenting with AVMs rupture and uncontrollable torrentially bleeding. We carried out emergent direct hemostasis, nasotracheal intubation, and staged embolization and sclerotherapy on this patient. The patient agreed to publish the case details and images.

CASE REPORT

A 25-year-old woman was admitted because of right face and head mass with obvious swelling, pulsation, and active bleeding. The patient was born with right face and head mass, the mass had grown gradually, and growth accelerated during adolescence. She is secundipara and the mass had been enlarged during each pregnancy. Previous computed tomography angiography supported the diagnosis of AVMs in the head and neck region. She suffered from bleeding from the mass 4 years ago, received suture hemostasis and external carotid artery embolization. Repeated bleeding had been occurred during the past 5 months. One day ago, the bleeding seemed to be uncontrollable and torrential. The patient was handled with pressure bandage and admitted to our hospital (Fig 1, *A*). The symptoms are consistent with Schöbinger stage IV.[6]

After admission, we rechecked the computed tomography angiography, which showed diffuse AVMs in the right face and neck region. The feeding artery stems from the external carotid artery with an elastic coil in it. An apparent malformed vascular mass and expansive jugular vein were found (Fig 1, *B*).

We organized a multidisciplinary consultation before surgery. Based on past experience and the literature, excision of this kind of lesion is frequently impossible and usually accompanied with torrential bleeding. Transarterial embolization had been undertaken with early recurrence because of quick formation of a lateral branch. Interventional treatment for AVMs was transferred from transarterial embolization to transvenous embolization and nidus eradication. We prefer a staged procedure, because a greater amount of sclerosant may result in

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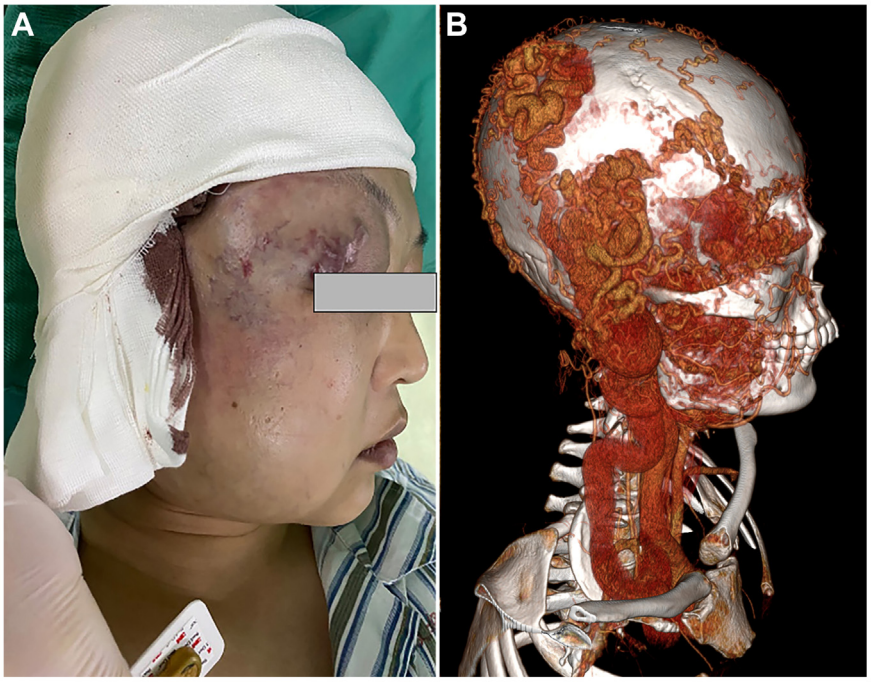

Fig 1. (A) The patient was handled with pressure bandage to stop the bleeding before administration. **(B)** Computed tomography angiography showed diffuse arteriovenous malformations (AVMs) in the right face and neck region.

unexpected small artery eradication, which can lead to local necrosis. For this patient, the primary treatment goal was to stop bleeding and prevent airway obstruction and local infection. The anesthesiology and otolaryngology departments were responsible for keeping the airway open. Nasotracheal intubation was planned and tracheotomy was on standby. The transfusion department helps to prepare the blood. Stomatology and plastic surgery departments were ready to handle unexpected situations during surgery. Infectious disease department was responsible for preventing from perioperative infection.

The patient received four episodes of treatment in total.

In the first treatment episode (Fig 2), we carried out nasotracheal intubation. Both femoral vein and femoral artery access were established. When we opened the pressure bandage, we could see an ulcer with pulsating bleeding in front of the right ear. A purse string suture with a gauze piece was carried out to stop the bleeding (Supplementary Video 1). Transarterial angiography showed diffuse AVMs in the right head and neck region; the feeding artery was mainly the enlarged external carotid artery, multiple aneurysmal small veins converged into a dominant outflow vein with drainage into the internal and external jugular veins. Angiography conformed to Yakes type IIIb.[6] We selected the outflow veins and external jugular vein, then embolized them with elastic coil (Interlock, 20-400 mm and 18-400 mm, 11 in total) from femoral vein access. Then we directly punctured the nidus percutaneously and embolized the drainage vein with elastic coil (Cook Nester, 22 in total). After drainage vein embolization, we conducted angiography to confirm that the blood flow rate was decreased. Then we punctured the lesion under ultrasound guidance and carried out intravascular sclerotherapy with absolute ethanol and 3% polidocanol foam. The dosage of absolute ethanol and 3% polidocanol foam was 41 mL and 20 mL, respectively. Intralesional interstitial sclerotherapy was carried out with bleomycin (150,000 IU bleomycin was dissolved in 10 mL 0.9% sodium chloride solution, mixed with 5 mg dexamethasone and 100 mg lidocaine to prepare the bleomycin solution); the total dose of bleomycin was 150,000 IU. The patient was transferred to the intensive care unit with endotracheal intubation.

Seven days later, the second treatment episode was carried out. The goal of this treatment episode was to carry out supplementary sclerotherapy and remove the gauze piece to avoid infection. We punctured the mass percutaneously and used angiography to delineate the drainage vein; the range of AVMs and diameter of drainage vein was significantly decreased from the first treatment. We used absolute ethanol and 3% polidocanol for intravascular sclerotherapy and bleomycin for intralesional interstitial sclerotherapy. The doses of absolute ethanol, 3% polidocanol foam, and bleomycin were 20 mL, 20 mL, and 150,000 IU, respectively. After we dismantled the previous purse string sutured gauze piece, the bleeding slowed (Supplementary Video 2). We then used

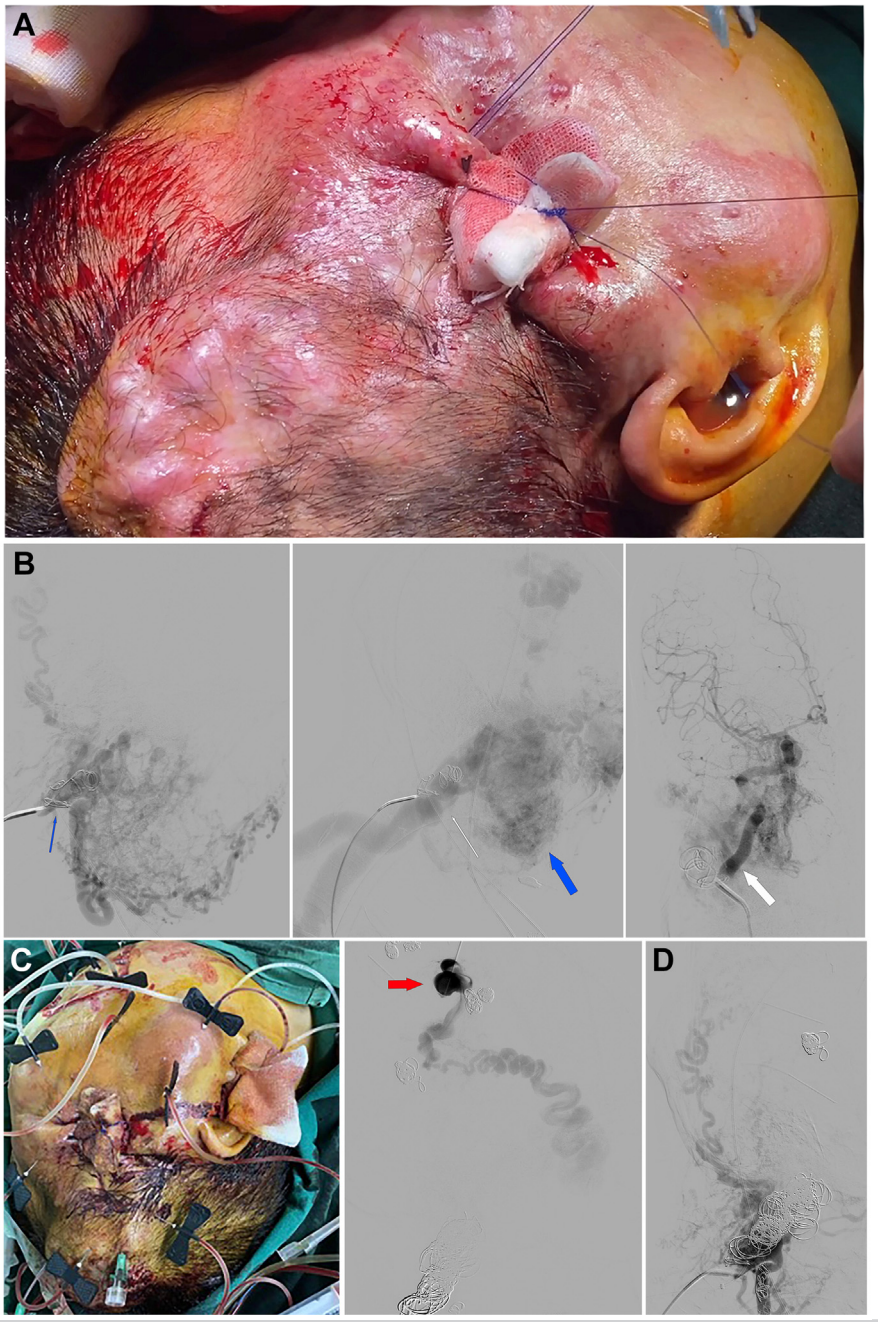

Fig 2. The first treatment episode. **(A)** Purse string suture with gauze piece was carried out to stop the bleeding. **(B)** Digital subtraction angiography showed diffuse arteriovenous malformations (AVMs) exist at the right head and neck region, the feeding artery was mainly the enlarged external carotid artery, the dominant outflow vein was internal and external jugular vein. The blue narrow arrow showed the external carotid artery and previously embolized elastic coil, The white narrow arrow showed the dominant outflow vein. the blue thick arrow showed the nidus, the white thick arrow showed the internal carotid artery. **(C)** After dominant outflow vein embolization, percutaneous direct lesion puncture and intravascular sclerotherapy with absolute ethanol and polidocanol was carried out. The red thick arrow showed that we percutaneous punctured the lesion. **(D)** Angiography showed AVMs become less after the first treatment episode.

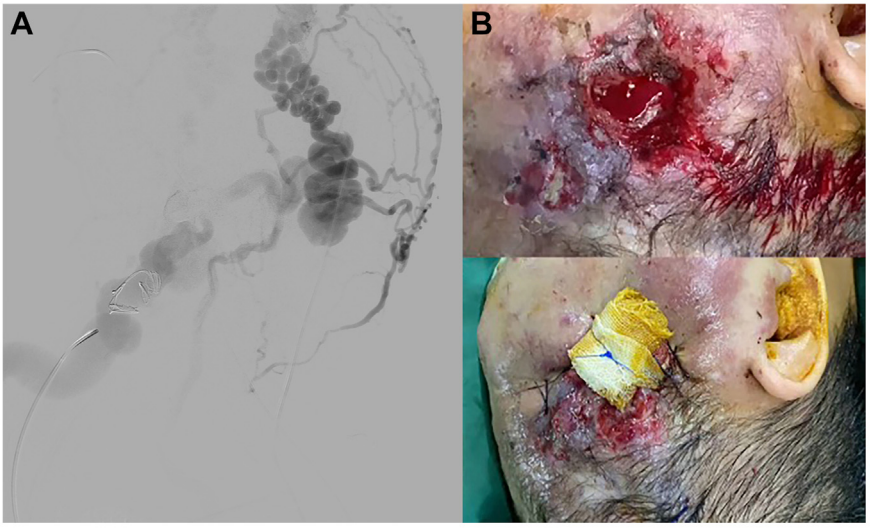

Fig 3. The second treatment episode. **(A)** Percutaneous direct lesion puncture and intravascular sclerotherapy with absolute ethanol and polidocanol was carried out. **(B)** The bleeding slowed and iodoform gauze for purse string suture was carried out to stop bleeding and prevent infection.

iodoform-soaked gauze for purse string suture to stop bleeding and prevent infection (Fig 3). The vital signs and consciousness were normal after endotracheal intubation removed. The patient was discharged 5 days later.

The wound healed 2 months after the second treatment episode. The mass shrank and pulsation weakened significantly.

The third treatment episode was carried out 7 months after the second episode. The primary goal was to check for effectiveness of the previous treatments. Whether to carry out further treatment depended on the angiography results. Digital subtraction angiography showed the range of AVMs and diameter of drainage vein was significantly decreased from before, but the outflow vein and external jugular vein still displayed in advance than distal capillaries. Outflow vein and external jugular vein were embolized with elastic coil (4 Interlock and 52 Cook Nester). Intravascular sclerotherapy was carried out with 25 mL absolute ethanol and 20 mL 3% polidocanol foam. Intralesional interstitial sclerotherapy was carried out with 150,000 IU bleomycin (Fig 4, *A* and *B*).

The last episode was carried out 1 year after the third. The main purpose was angiography. Transarterial angiography showed that the external carotid artery was occluded (Fig 4, *C*). The abnormal vascular cluster was no longer observed. Internal carotid artery angiography showed AVMs of ophthalmic artery (Fig 4, *D*). We directly punctured the upper eyelid and carried out intravascular sclerotherapy with 5 mL 3% polidocanol foam (Fig 4, *E*).

The last follow-up showed the ulcer was cured without recurrence (18 months after the initial treatment; Fig 5, middle).

DISCUSSION

AVMs of head and neck maybe life threatening, especially those with uncontrollable torrential bleeding and airway obstruction. AVMs usually present as progressive, diffuse, and infiltrative, so early intervention was advocated to avoid late complications and improve treatment effectiveness.[7]

Head and neck AVMs are hard cure completely; the primary goal is to prevent life-threatening complications. Complete excision for head and neck AVMS is possible rarely. Partial excision may alleviate symptoms, but usually accompanied by a large amount of blood loss. The advantage of interventional treatment is that it is minimally invasive and repeatable. Transarterial embolization could alleviate symptoms, but carries a high recurrence rate because of quick formation of lateral branches. It was reported that embolization with n-butyl-cyanoacrylate glue, absolute ethanol, or Onyx (Medtronic, Minneapolis, MN) could achieve satisfactory devascularization, with a relatively low complications rate,[8] but the recurrence rate remains high.[5] The current interventional treatment strategy evolved from transarterial embolization to transvenous embolization and nidus eradication. Outflow vein embolization could slow down blood flow velocity and prolong the contact time of sclerosant and nidus, which could improve the sclerosant efficiency[9] and decrease the recurrence rate. Intralesional interstitial bleomycin is also a safe and effective for AVMs.[10] Endovascular treatment for head and neck AVMs remains challenging; detailed assessment of the angioarchitecture, proper selection of embolization approach, and material are crucial.

When uncontrollable torrential bleeding occurs, multidisciplinary management is necessary to stop the bleeding and maintain the airway. The

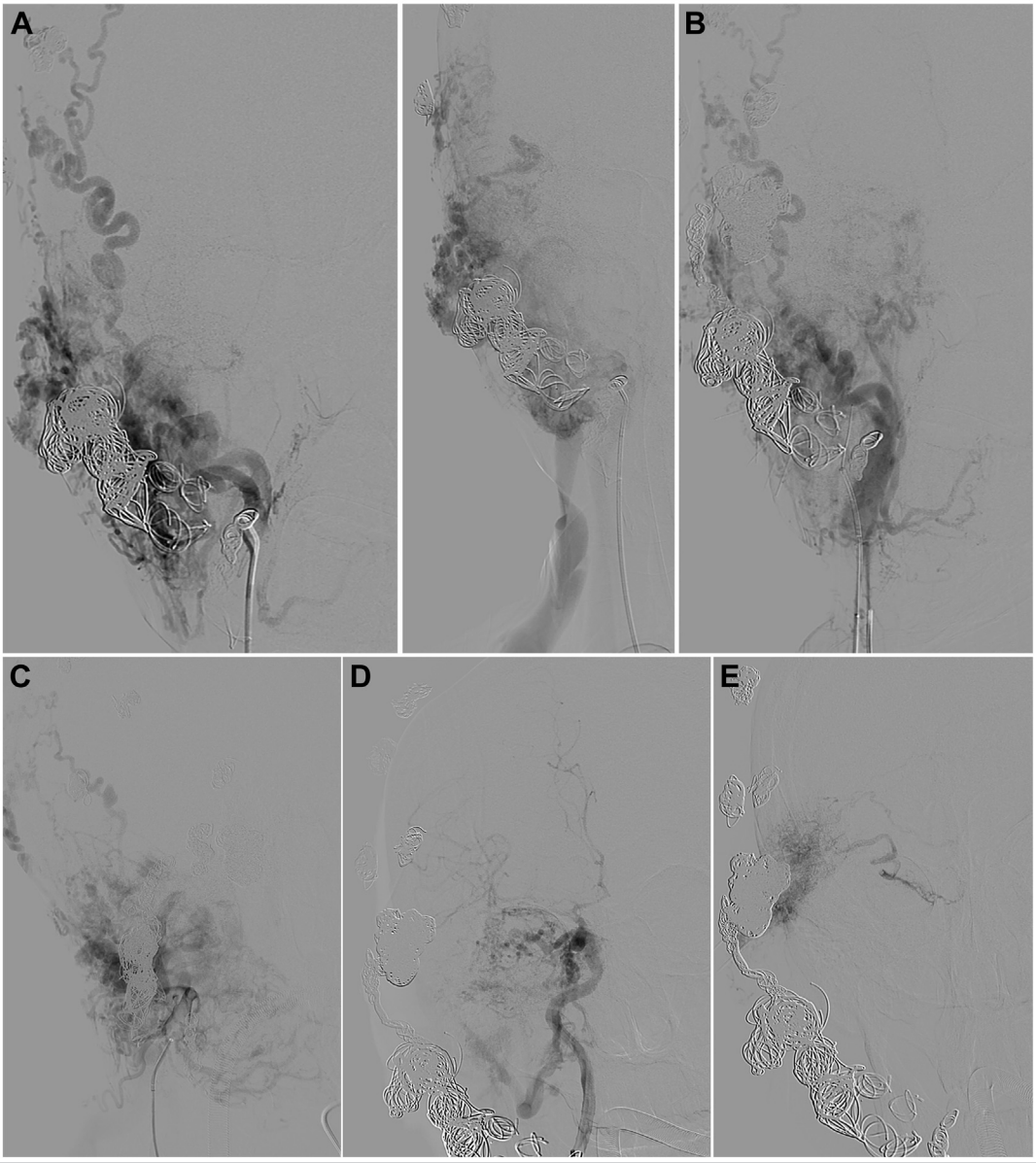

Fig 4. The third and fourth treatment episodes. **(A)** The third treatment episode. Digital subtraction angiography showed the range of arteriovenous malformations (AVMs) and diameter of drainage vein was significantly reduced than before. Dominant outflow vein embolization, intravascular sclerotherapy with absolute ethanol and polidocanol, and interstitial sclerotherapy with bleomycin were carried out. **(B)** Digital subtraction angiography after the third treatment episode. **(C)** The fourth treatment episode. Digital subtraction angiography showed that the external carotid artery was occluded. The abnormal vascular cluster was not observed. **(D)** The internal carotid artery angiography showed AVMs of ophthalmic artery. **(E)** Percutaneous upper eyelid puncture and intravascular sclerotherapy with 5 mL 3% polidocanol foam was carried out.

anesthesiology department is responsible for airway management and handling possible cardiovascular events, especially when injecting absolute ethanol.[9] The otolaryngology department should be ready for tracheotomy in handling patients with AVMs involving the trachea. The stomatology department sometimes is needed for mandibular AVMs, which usually result in unpredictable and massive hemorrhage when tooth extraction is carried out. The intensive care unit and infection disease department were also important for

Fig 5. The wound cured gradually and computed tomography angiography (CTA) showed the range of arteriovenous malformations (AVMs) decreased.

perioperative management and infection-related issues.

CONCLUSIONS

Uncontrollable torrential bleeding of head and neck AVMs is critical and life threatening. Multidisciplinary collaboration is needed to achieve a good outcome.

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DISCLOSURES

None.

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