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Successful treatment of traumatic injury to the pharyngeal branch of the ascending pharyngeal artery using transcatheter arterial embolization: two case reports

Embolization for ascending pharyngeal artery

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Abstract

BACKGROUND

The ascending pharyngeal artery (APhA) comprises the pharyngeal trunk (PT) and neuromeningeal trunk. The PT feeds the nasopharynx and adjacent tissue, which potentially connects with the sphenopalatine artery (SPA), branched from the internal maxillary artery (IMA). Due to its location deep inside the body, the PT is rarely injured by trauma. Here, we present two cases that underwent transcatheter arterial embolization (TAE) of the PT of the APhA due to trauma and iatrogenic procedure.

CASE SUMMARY

Case 1

A 49-year-old Japanese woman underwent transoral endoscopy under sedation for a medical check-up. The nasal airway was inserted as glossoptosis occurred during sedation. Bleeding from the nasopharynx was observed during the endoscopic procedure. As the bleeding continued, the patient was referred to our hospital for further treatment. Contrast-enhanced computed tomography (CT) demonstrated extravasation in the nasopharynx originating from the right Rosenmuller fossa. TAE was performed and the extravasation disappeared after embolization.

Case 2

A 28-year-old Japanese woman who fell from the sixth floor of a building was transported to our hospital. Contrast-enhanced CT demonstrated a complex facial fracture accompanying extravasation in the left pterygopalatine fossa to the nasopharynx. Angiography demonstrated an irregular third portion of the IMA. As angiography after TAE of IMA demonstrated extravasation from the PT of APhA, additional TAE to the artery was performed. The bleeding stopped after the procedure.

CONCLUSION

Radiologists should be aware that the PT of APhA can be a bleeding source, which has potential connection with SPA.

Key Words: Case report; arteries; catheters; trauma; injuries; hemorrhage

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Core Tip: The pharyngeal trunk (PT) of ascending pharyngeal artery (APhA) feeds the nasopharynx and the adjacent tissue, which potentially has a connection with the sphenopalatine artery (SPA) branched from the internal maxillary artery (IMA). The PT is rarely injured by trauma as it is located deep inside the body; however, it might be a bleeding source of nasopharynx in patients with trauma. Moreover, the PT of APhA might be a bleeding source after performing embolization to SPA. Radiologists should be aware that the PT of APhA can be a bleeding source in patients with trauma, which has potential connection with SPA.

INTRODUCTION

The ascending pharyngeal artery (APhA) originates from the external carotid artery or its branches and comprises the pharyngeal trunk (PT) and neuromeningeal trunk (NT)[1]. The NT is an important artery that supplies the lower cranial nerves and dura. Previous case reports involving these arteries have primarily focused on how to avoid neural complications[2]. The PT has also been discussed in patients with idiopathic epistaxis[3], benign or malignant neoplasm[3,4], trauma, and iatrogenic damage[3,5,6], which is analogous to traumatic epistaxis. During iatrogenic procedures, the PT can be injured. Given its location deep inside the body, it can be difficult to stop the bleeding by compression.

Transcatheter arterial embolization (TAE) is a well-established procedure in radiology[7]. Radiologists can effectively stop bleeding by TAE when the bleeding

source is an artery. The indications of TAE to the APhA include meningioma[8], juvenile angiofibroma[9], paraganglioma[10], dural arteriovenous fistula[11], or hemorrhage due to various causes[6,12,13]. Among these pathologies, hemorrhage is an urgent issue because a large amount of hemorrhage can cause airway or circulation problems. Moreover, since hemorrhage cannot be compressed, TAE should be considered. Hemorrhage may be spontaneous, trauma, or tumor-related. Among these causes, traumatic hemorrhage from APhA is extremely rare as the area is located deep inside the body. However, radiologists should aware that the PT of APhA can lead to nasal hemorrhage. Moreover, the anatomy of the branches and sub-branches of the PT of APhA are complicated and APhA itself has a potential connection with the sphenopalatine artery derived from the internal maxillary artery (IMA). This anatomical characteristic influences the embolization procedure for bleeding from the PT of APhA. Here, we present two cases that underwent TAE of the PT of APhA due to trauma.

CASE PRESENTATION

Chief complaints

Case 1

Epistaxis.

Case 2

Systemic trauma.

History of present illness

Case 1

A 49-year-old Japanese woman underwent transoral endoscopy during a medical check-up. An endoscope was inserted into the nasal airway as glossoptosis occurred during sedation. Bleeding from the nasopharynx occurred during the endoscopic procedure, and the patient was referred to another hospital to manage the bleeding. The clinician decided to discharge the patient after observation for only one night, because they considered the bleeding to have stopped. However, the patient felt that the

bleeding continued and was referred to our hospital for further treatment (day 1 at our hospital).

Case 2

A 28-year-old Japanese woman who fell from the sixth floor of a building was transported to our hospital by ambulance.

History of past illness

Case 1

Nothing.

Case 2

Depression.

Personal and family history

Case 1

Nothing.

Case 2

Nothing.

Physical examination

Case 1

An otorhinolaryngologist examined the patient's nasopharynx *via* nasal endoscopy. The posterior left wall of the nasopharynx was covered in clots and bleeding was observed from the inside of the clot.

Case 2

Laboratory examinations

Case 1

WBC 13.5 × 10^3 /dL Hb 13.2 g/dL; Plt 244 × 10^3 /dL; APTT 36.9 s; and APTT control 28.0 s.

Case 2

Imaging examinations

Case 1

Contrast-enhanced CT demonstrated extravasation in the nasopharynx (**Fig. 1A**) originating from the right Rosenmuller fossa. The otorhinolaryngologist inserted a balloon catheter in the nasopharynx and inflated it to compress the wall of the nasopharynx.

Case 2

The facial fracture was remarkable and excessive nosebleed was observed. Bilateral temporal processes, mandibular processes, pterygoid plates, zygomatic arches, and Agger nasi were fractured. The bilateral, anterior, inferior, and medial wall of the maxillary sinus and palatine bone were also fractured. Extremity fractures were also observed. Due to excessive nasal and transoral bleeding, tracheal intubation was performed to secure the airway. The patient was in a state of shock with blood pressure of 79/57 mmHg and heart rate of 122 /min. Rapid extracellular fluid administration and transfusion was performed. As the response to infusion was good, the origin of shock was considered to be hemorrhage.

FINAL DIAGNOSIS

Case 1

Iatrogenic nasopharyngeal injury.

Case 2

As clinicians and radiologists suspected that the major hemorrhage was in the nasopharynx, intervention was planned.

TREATMENT

Case 1

The next day, angiography from the right PT of APhA showed trauma causing extravasation (**Fig. 1B**). Cone beam CT was performed in Xper CT mode (Philips Japan, Ltd, Tokyo, Japan) by injecting 1:3 diluted 300 mgI contrast media at 0.5 mL/second (**Fig. 1C**) to precisely reveal the anatomy. An artery to the Rosenmuller fossa was determined to be the representative vessel. A 0.010 inch coil of 1.5 mm × 4 cm size was placed in the branch of an artery of the Rosenmuller fossa. Two 0.010 inch coils measuring 1.5 mm × 3 cm and 1.0 mm × 3 cm were placed in the branch of the torus tubarius (**Fig. 1D**). The extravasation disappeared angiographically just after the embolization.

Case 2

Angiography from the left external carotid artery demonstrated an irregular shape of the third portion of the IMA. Embolization with a gelatin sponge and coil to the third portion of the IMA was performed. Angiography after the procedure from the left external carotid artery demonstrated extravasation from the PT of APhA (**Fig. 2B**). A microcatheter was inserted into the PT of APhA and embolization with a gelatin sponge was performed.

OUTCOME AND FOLLOW-UP

Case 1

The balloon catheter was deflated on day 6, after which no bleeding was observed *via* nasal endoscopy. The patient was discharged on day 8.

Case 2

The bleeding stopped after the procedure. Plastic surgery for facial bone fractures and orthopedic surgery for extremity fractures were planned.

DISCUSSION

Epistaxis from APhA caused by trauma is extremely rare as the region is located deep inside the body. To date, only a few cases of patients who underwent embolization for PT of APhA have been reported[6,13].

The anatomy of the PT of APhA has been previously described to comprise superior, middle, and inferior branches[1]. A branch of the Eustachian tube and musculospinal branch have also been described[14]. In Case 1, the artery of the Rosenmuller fossa was the source of bleeding. As this artery has not been described in previous reports, we propose naming it the "artery of Rosenmuller fossa." The superior branch of the PT of APhA comprises three sub-branches: artery of Rosenmuller fossa, artery of torus tubarius, and artery of the superior to the lateral wall, which might communicate with the posterior lateral nasal branch and posterior septal branch of the sphenopalatine artery, which was described as the maxillary branches by Lasjaunias *et al.* [15]. Considering these anatomical features, proximal embolization of a sub-branch of the PT of APhA would result in collateral perfusion from the adjacent branch. Therefore, we performed coil embolization of two sub-branches of PT of APhA in Case 1.

We could not determine the extravasation site of the PT of APhA in Case 2 from the initial contrast-enhanced CT image. The likely reasons are as follows: (1) bleeding started after CT was performed along with coagulopathy and (2) embolization of the third portion of IMA resulted in collateral bleeding from the PT of APhA. The latter is an important issue when performing embolization of IMA in patients with epistaxis, as it is necessary to consider collateral flow from the PT to APhA. Radiologists should consider the PT of APhA as a bleeding source in patients who have undergone embolization of IMA.

In Case 1, the insertion of the endoscope into the nasal airway may have injured the nasopharyngeal wall. A similar case has been previously described[6]. Inserting a medical device, *e.g.*, a nasogastric tube or ileus tube, through the nasal space without directly watching the tip of the device is common. Clinicians and radiologists should know that inserting any medical device through the nasal space carries the risk of injuring the nasopharyngeal wall. Moreover, sites hidden from the endoscope, such as the Rosenmuller fossa, might be dangerous once bleeding is observed. Since stopping the bleeding by compression is difficult, TAE might be required.

The embolization materials in Case 2 were gelatin sponge and metallic coils. Gelatin sponge is usually the main choice of material to stop bleeding from the terminal artery as it can directly reach the injured vessel. However, when a metallic coil is used to stop the local arterial flow, it can represent a risk of collateral flow to the peripheral side of the coil. In Case 1, coil embolization was selected to avoid non-target embolization with gelatin sponge to the NT of APhA by backflow of the embolization material. Moreover, because Case 1 was iatrogenic trauma, we had to be careful to not cause any complications. In contrast, in Case 2, a gelatin sponge was used to avoid the collateral vascular supply with proximal embolization with coils. There was a risk of hemorrhage after the procedure due to the diffuse fractures, which could cause movement of bone fragments. Therefore, whole embolization of the PT of APhA was performed. A previous report described the use of n-butyl cyanoacrylate (NBCA) for embolization of APhA [16]. NBCA is a liquid-type embolization material that can achieve complete and eternal embolization, and so is preferred when hemorrhage is severe or life-threatening. However, as non-target embolization could cause cranial nerve paralysis, the application of APhA must be carefully scrutinized.

The current article is subject to some limitations. The artery of Rosenmuller fossa could only be identified in Case 1 by Xper CT and angiography. More cases are needed to determine whether this artery can be identified.

CONCLUSION

This article reports two cases of TAE of the PT of APhA due to trauma. We identify and propose a new name for the "artery of Rosenmuller fossa." Although bleeding from the PT of APhA is rare, radiologists should be aware that the PT of APhA can cause nasal hemorrhage in patients with trauma. An appropriate embolization material should be selected by considering how the target vessels are distributed, cranial nerve preservation, and bleeding severity.

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