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Case Report

Transarterial embolization of acute carotid blowout syndrome postneck dissection ☆

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ABSTRACT

Carotid blowout syndrome is described as rupture of the carotid artery most commonly following head and neck dissection. It is an uncommon complication that can be fatal if not diagnosed and managed promptly. This report will discuss the case of a 45-year-old male, who developed carotid blowout syndrome following receiving several therapies for his laryngeal cancer. It will include how careful assessment of the patient's current state and taking into consideration his previous history and risk factors can lead to a case-tailored management plan to be performed in a timely manner, maximizing the chances of a successful life-saving procedure.

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Introduction

A well-recognized complication of head and neck cancer is tumor infiltration that can result in erosion and rupture of extracranial carotid arteries. This process results in an extremely high mortality rate. When carotid rupture or blowout occurs, it can manifest in several different clinical pictures, including acute transoral/transcervical hemorrhage, as well as a more sinister impending hemorrhage in asymptomatic patients of carotid artery invasion. Two known factors that can lead to carotid blowout syndrome (CBS) are wound breakdown and history of irradiation at the site of dissection. Patients with

previous irradiation are at approximately 8-fold risk of developing a carotid rupture, putting radiotherapy at the top of the list of predisposing factors for the development of CBS [2,5].

CBS after head and neck surgery

Incidence

Previously published incidence numbers of CBS in oncology patients post head and neck surgery fall between 3% and 4.5%. [5]. When analyzing irradiated radiotherapy

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patients separately, incidence rate is 4.5% - 21.1% and 0% - 2.4%, respectively. These numbers support the previously reported 7.6-fold increase of risk of developing CBS in previously irradiated patients. [2,4,6,7].

Pathophysiology and Predisposing factors for CBS

When patients are exposed to radiation therapy, the free radicals produced lead to thrombosis and obliteration of the adventitial vasa vasorum, fibrosis, early atherosclerosis and weakening of the vessel wall. These changes to the adventitia disrupt the blood supply causing ischemia, which eventually leads to carotid artery rupture. Some patients can suffer from spontaneous radiation induced necrosis of the arterial wall, due to the pathophysiology described above. [2,3].

Another note-worthy aspect is lack of supporting healthy tissues in cases of radical neck dissection, exposing the carotid artery to the risk of rupture. This provides an explanation to the 8-fold increase in risk of developing CBS in patients who underwent radical neck dissection.

Prognostic factors

Predicting the outcome of CBS can be performed by assessing the GCS score, Other factors include the site of the primary tumor, origin of bleeding, type of management and intervention, and time to intervention [4].

Management of CBS via endovascular embolization

Endovascular management showed remarkable improved outcomes when performed on suitable candidates [4,11,19]. Embolization procedures are now the most performed endovascular management of CBS. But with occlusion of the CCA/ICA, the risk of developing delayed cerebral ischemic complications arises in patients who has incomplete circle of Willis occlusion, contralateral carotid severe stenosis/total occlusion, thus endovascular repair with covered stents in these patients is preferred.

Complications of endovascular management

stent replacement poses a higher risk of CBS recurrence (44%) when compared to embolization (10%) and surgical ligation (25%) [7].

A systematic review revealed a general rebleeding rate of 27%, when this number is further dissected, it shows that 17% of these patients were treated with coils, while 34% had covered stent placement [18]. Other publications share findings that solidify this conclusion, where rebleeding rates were lower following embolization (11%-21%) compared to (25%-85%) following treatment with covered stents [1,8,10,15,16,20].

Case report

Patient's history

First visit

A 45-year-old male, who is a known case of long-standing laryngeal cancer, presented to the emergency department

complaining of a single episode of severe hematemesis. He had a negative history for abdominal pain, chest pain, palpitations, shortness of breath, or loss of consciousness.

His past medical history included chemotherapy and radiation therapy done 3 years ago, and a surgical history of elective total laryngectomy and modified radical neck dissection done 1 month ago.

The patient was shifted to King Hamad University Hospital, due to the unavailability of the facility/service in his main hospital.

Findings

Upon admission, a CT carotid angiogram was done which revealed the postlaryngectomy surgical bed shows diffuse ill-defined multiloculated fluid collection that is of high density (blood), containing multiple air foci. Postcontrast images show increased density of the fluid collection along the right side of the surgical bed, indicative of an active bleeder. No definite ring enhancing lesions were noted, eliminating the suspicion of infected fluid collection, with no evidence of airway compromise or additional lesions (Fig. 1).

Selective cannulation of the right CCA was done (Fig. 2A) which revealed pseudo aneurysm arising from the proximal part of the right ECA. Selective embolization by deployment of multiple coils

Postcoiling angiogram was done (Fig. 2B) which revealed a good response with no evidence of abnormal arterial blush.

The patient had a stable hospital stay following the procedure and was discharged 3 weeks later with no complications.

Second visit

A month following his initial presentation, the patient presented with a history of a single episode of severe hematemesis. Prior to his presentation, the patient was seen in another medical facility and was reviewed by a vascular surgery team. Due to the status of the carotid wall which was sloughed at the time with an unhealthy appearance, in addition to his risk factors packed history, the vascular surgery team concluded that the patient is a candidate for carotid artery embolization. Therefore, the patient was referred to King Hamad University Hospital, due to the unavailability of the appropriate facility/service in his main hospital. Upon arrival the patient was in shock and on vasopressors started by his referring physician. He received 3 units of packed RBCs before shifting him to King Hamad University Hospital and required 7 more units after his arrival.

The interventional radiology team leader was consulted regarding further investigation and management for the patient. An urgent carotid angiogram revealed severe active arterial bleeding in the laryngeal region (Fig. 3).

Balloon obstruction test is not recommended in such a patient as he was hemodynamically unstable with altered level of consciousness, therefore, an angiogram was performed to confirm the patency of the circle of Willis through the contralateral carotid artery and the posterior circulation (Fig. 4C).

Following the coils deployment, multiple angiograms were repeated (Fig. 4) that showed that hemostasis was achieved

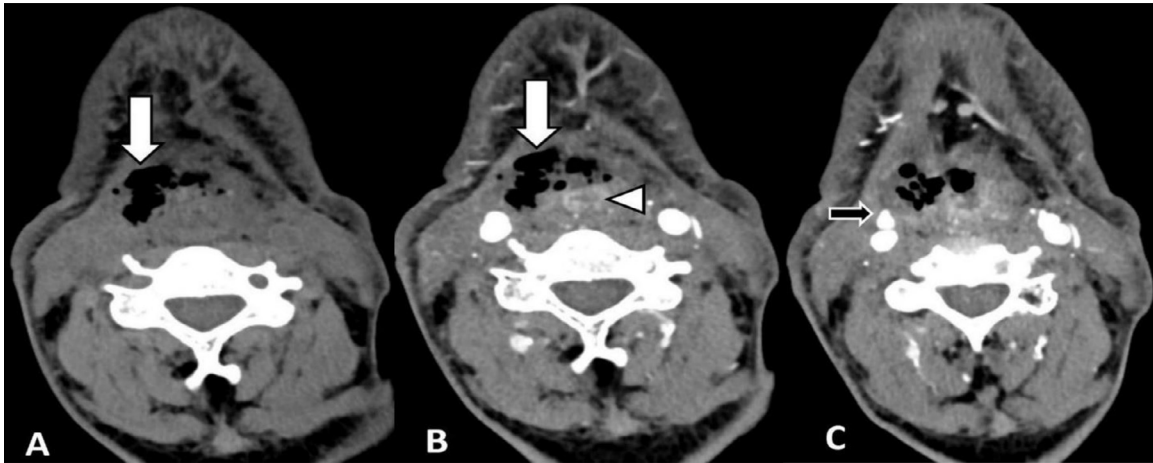


Fig. 1 - (A) plain CT multiple air locules (white arrow), (B) postcontrast axial CT increased density of the fluid collection along the right side of the surgical bed (arrowhead). (C) small pseudoaneurysm arising from RT ECA (black arrow).

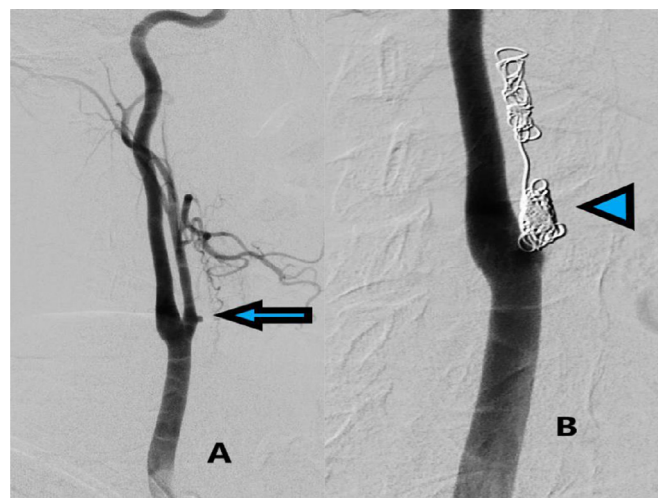


Fig. 2 - (A) Small pseudoaneurysm arising from RT ECA (Arrow), (B) successful coiling of right ECA pseudoaneurysm.

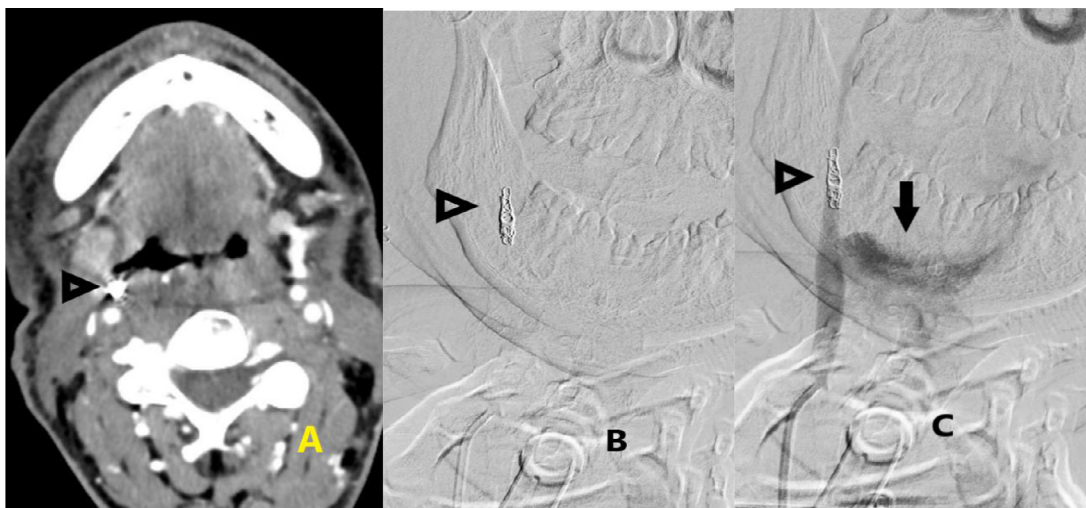


Fig. 3 - (A) Contrast enhanced axial CT shows previous ECA coils (arrow head), (B) selective RT CCA Pre injection sequence, (C) Postinjection sequence showing blushing/active bleeding site (solid arrow).

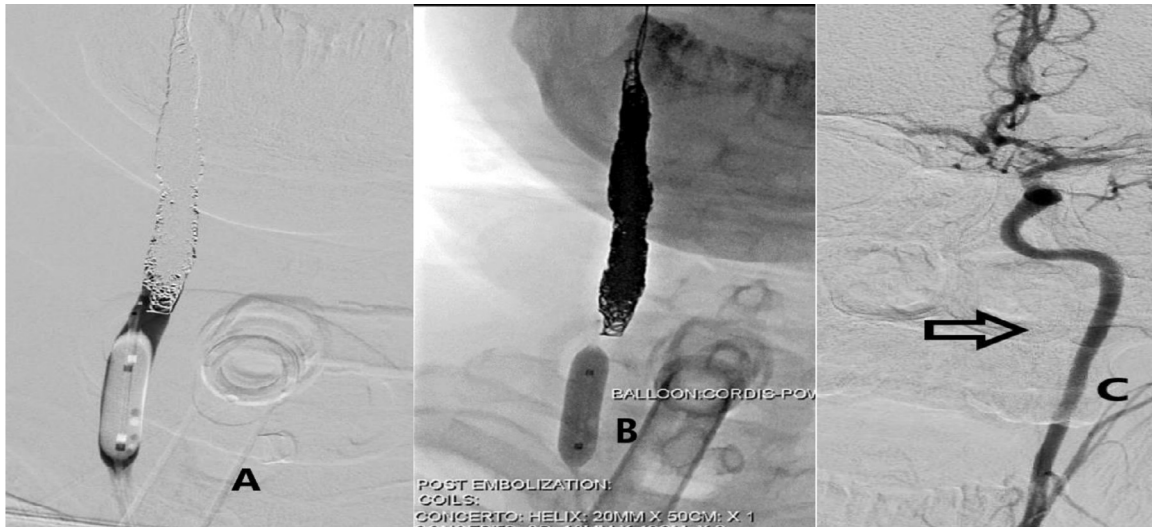


Fig. 4 – (A and B) Selective cannulation of the right common carotid artery was done by head way 21 microcatheter followed by inflation of CORDIS POWER FLEX 6 MM x 20 CM balloon to induce hemostasis, then multiple coils were deployed proximal to the balloon location. **(C)** Patency of the circle of Willis through the patent LT CCA and the posterior circulation.

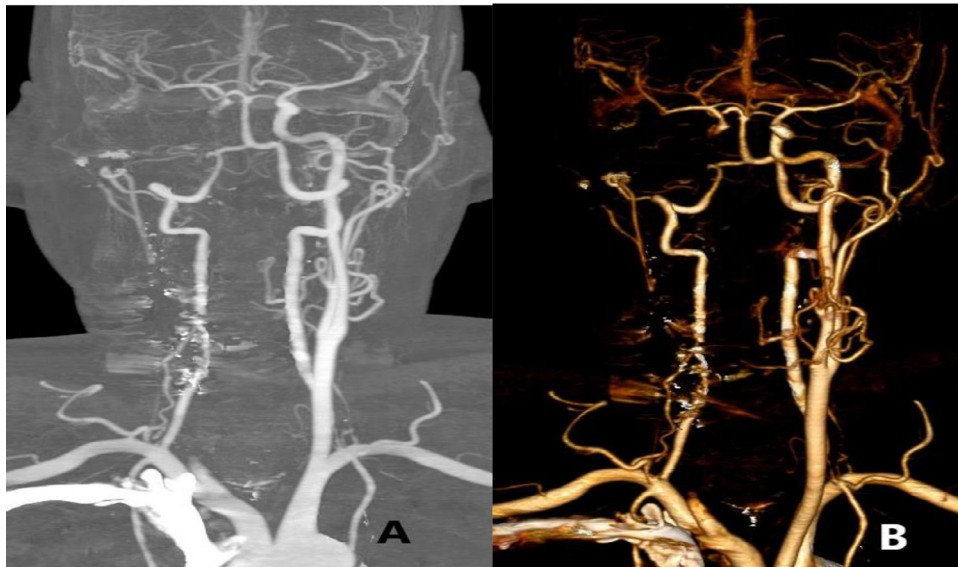


Fig. 5 – (A and B) CT angiogram showing normal cerebral circulation.

with successful occlusion of the right CCA (Fig. 5). The procedure was concluded with no acute complications occurring during, or immediately after.

Discussion

CBS remains a life-threatening complication, despite the multiple management options that became available over the years. The choice of intervention is still decided by the status of the patient and the severity of the condition. Surgical

ligation, endovascular stenting, or embolization all have been concluded to be beneficial when used for the right patient, but all do come with their own risks.

The endovascular approach to manage CBS was introduced as an alternative to the classic surgical ligation successful for immediate bleeding cessation in those with acute hemorrhage that was associated with high mortality rates to reduce the risk of complications as much as possible as hemiplegia/paresis, cerebral artery occlusion and postoperative neurologic complications. Reports have suggested a higher stroke rate with surgical or endovascular ligation/occlusion compared to endovascular embolization [9].

These patients undergo an angiogram to confirm the patency of the circle of Willis through the contralateral carotid artery and the posterior circulation [14].

There are several methods of endovascular occlusions that can be performed based on the clinical scenario. Embolization, involves deployment of embolic materials (microparticles, microcoils, injected acrylic adhesive or detachable balloon) to cover the lesion from the distal end to the proximal end. (1) Endovascular occlusion is indicated in cases where the lesion involves the trunk of the ECA, in addition to the CCA

The Amplatzer vascular plug can be used in cases where rapid occlusion is required, for example, patients who are hemodynamically unstable or those with lesions involving large vessels. The Amplatzer plug is a self-expanding cylindrical wire mesh that is delivered through a guide catheter to a point proximal to the lesion when it expands to take the shape of the vessel, leading to occlusion [17].

When endovascular procedures are done for the right patients, by an experienced team, lethal short-term complications can be avoided, as presented in this case.

Outcomes of endovascular procedures

When looking at different methods of CBS management, mortality rate for those who underwent endovascular treatment was 8.2%, with no significant difference in mortality rates when comparing endovascular embolization 8% and carotid stenting 10.1% [13]. The mean time from CBS diagnosis to death was reported to be 4-12 months, with no significant difference between the endovascular method used [1,12,21]. Finally, only 10% of patients were reported to pass the 3 years mark of survival following CBS [12,16,20,21].

Conclusion

Weakening and eventual rupture of the carotid artery is one of the most devastating complications that occurs in patients treated for head and neck cancer. CBS is the result of necrosis of the arterial wall, which can occur following resection of head and neck cancer patients. Endovascular embolization remains the most common treatment among patients with head and neck cancers with lower overall rates of postoperative neurologic complications including hemiplegia/paresis and cerebral artery occlusion. Acute ischemic stroke, one of the more common complications associated with treatment of carotid blowout, occurred in less than 3% of patients.

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