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FULL PAPER

Follow-up for covered stent treatment of carotid blow-out syndrome in patients with head and neck cancer

¹CHIA-JEN WU, MD, ¹WEI-CHEN LIN, MD, ^{1,2}JUI-SHENG HSU, MD, PhD, ¹I-TING HAN, MD, ¹TSYH-JYI HSIEH, MD, ¹GIN-CHUNG LIU, MD, PhD and ¹I-CHAN CHIANG, MD

¹Department of Medical Imaging, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

²Graduate Institute of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung, Taiwan

Address correspondence to: Dr I-Chan Chiang

E-mail: yphs312@hotmail.com

Objective: Carotid blow-out syndrome (CBS) is a life-threatening complication of head and neck cancer (HNC). One of the various methods used for emergency management of CBS is covered stent placement (CSP). Our initial experience in CSP is evaluated and compared with reports in the literature.

Methods: This study analysed 17 patients with HNC who had received CSP for CBS at Kaohsiung Medical University Chung-Ho Memorial Hospital from May 2005 to December 2013. The medical records and images for these patients were retrospectively reviewed to evaluate the causes of CBS, treatment success rates and complications.

Results: The initial angiography success rate was 100%. Procedural or periprocedural complications were noted in two (12%) cases, both suffering from cerebral vascular accident (CVA). Short-term complications were noted in

eight (47%) cases, including four rebleeding cases and four CVA cases. Medium- to long-term complications were noted in nine cases, which included two asymptomatic in-stent thrombosis cases, one symptomatic CVA case, two abscess formation cases and four rebleeding cases. Overall, eight (47%) cases of rebleeding occurred during follow-up. Three of the eight cases were fatal, accounting for 27% of the all-cause mortality.

Conclusion: Although CSP is considered effective for achieving haemostasis in patients with HNC with CBS, the medium- to long-term outcomes are unfavourable owing to high risks of rebleeding, CVA and other complications. Therefore, CSP should be considered a temporary life-saving technique rather than a definitive treatment.

Advances in knowledge: Analysis of the relatively large series of patients with HNC in this study suggests that CSP is a useful temporary treatment for CBS.

INTRODUCTION

Carotid blow-out syndrome (CBS) is a life-threatening complication in patients with head and neck cancer (HNC).

The various emergent managements for CBS include surgical ligation and endovascular treatment. Covered stent placement (CSP) is among the most widely reported treatments.

Chang et al¹ reported covered stent treatment for eight cases of HNCs complicated with CBS. Hoppe et al² reported a larger series of 25 cases of CBS treated with covered stent, including 13 cases of HNC. Shah et al³ reported 10 patients with HNC complicated with CBS, treated with covered stent.

This study analysed a relatively large series of patients (17 patients) who had received emergent CSP for HNC complicated with CBS.

The aim of this study was to evaluate our initial experience in this technique and to compare our experience with those reported in previous studies. Another aim was to evaluate possible causes of CBS in this series of patients.

METHODS AND MATERIALS

Patient population

This study analysed data for 17 patients with HNC who had received CSP for CBS at Kaohsiung Medical University Chung-Ho Memorial Hospital from May 2005 to December 2013 (Table 1). The review of images and medical records for these patients was approved by the Institutional Review Board of Kaohsiung Medical University Chung-Ho Memorial Hospital. All patients were male. Most (16) patients had received chemotherapy. Radiation therapy and surgery had been performed in 12 and 12 patients, respectively. The locations of the pathological vascular lesions included internal carotid artery (ICA), common carotid artery (CCA), external carotid artery and their branches.

Table 1. Baseline characteristics of patients receiving covered stent treatment

Patient number	Age (years)	Sex	Cancer type	Treatment history	Presentation	Location of vascular lesion	Stent
1	55	M	Mandible SCC	CT + OP	Bleeding from neck necrotic tissue	Pseudoaneurysm from right ECA	Fluency® Vascular Stent Graft (BARD)
2	39	M	Right buccal and lip SCC	CT + OP		Pseudoaneurysm from right CCA	Wallgraft™ (Boston Scientific)
3	62	M	Hypopharyngeal cancer	CT + OP + RT		Pseudoaneurysm from right CCA	Wallgraft (Boston Scientific)
4	31	M	Left buccal SCC	OP + CT + RT	Bleeding from wound	Active bleeding from left proximal ECA	Wallgraft (Boston Scientific)
5	40	M	Tongue cancer	CT + OP		Pseudoaneurysm from common trunk of the right lingual and facial arteries	Wallgraft (Boston Scientific)
6	45	M	Hypopharyngeal cancer	CT + RT	Massive oral bleeding with loss of consciousness at home s/p CPR	Active bleeding from left distal CCA	Wallgraft (Boston Scientific)
7	43	M	Oral SCC	CT + OP + RT	Massive oral bleeding	Active bleeding from left ICA	Fluency Vascular Stent Graft (BARD)
8	59	M	Hypopharyngeal cancer (SCC)	CT + RT	Active oral bleeding	Pseudoaneurysm from left ECA with active bleeding	Fluency Vascular Stent Graft (BARD)
9	46	M	Tonsillar cancer	CT + RT	Massive bleeding from oral cavity and tracheostomy	Active bleeding from left lingual artery	Fluency Vascular Stent Graft (BARD)
10	39	M	NPC	CT + OP + RT	Epistaxis for 3 days	Active bleeding from right ICA	Wallgraft (Boston Scientific)
11	42	M	Tonsillar cancer	CT	Haemoptysis with epistaxis	Suspect active bleeding from right lingual artery	Fluency Vascular Stent Graft (BARD)
12	43	M	Hypopharyngeal cancer	CT + RT + OP	Large bleeding from mouth, fistula and tracheostomy	Pseudoaneurysm from right CCA with active bleeding	Viabahn® (Gore®)
13	50	M	Hypopharyngeal cancer	CT + RT	Oral and nasal bleeding	Suspicious bleeding point in the cervical segment of the left ICA	Viabahn (Gore)
14	50	M	Tongue cancer (SCC)	OP + CT + RT	Haematemesis	Active bleeding from left lingual artery	Viabahn (Gore)
15	47	M	Papillary thyroid cancer with local metastasis	OP + RT	Bloody sputum from the tracheostomy and mouth	25 July 2013 CT: necrosis, haemorrhage from probably left ICA	Viabahn (Gore)

(Continued)

Table 1. (Continued)

Patient number	Age (years)	Sex	Cancer type	Treatment history	Presentation	Location of vascular lesion	Stent
16	47	M	Left lower gum SCC	OP + CT		Pseudoaneurysm from left ECA	Viabahn (Gore)
17	27	M	Hard palate, oropharyngeal spindle cell carcinoma, supraglottic SCC	OP + CT + RT	Active bleeding from nose, mouth and neck fistula	Right facial artery pseudoaneurysm s/p NBCA embolization 14 days early, active bleeding from right proximal facial artery	Viabahn (Gore)

CCA, common carotid artery; CPR, cardiopulmonary resuscitation; CT, chemotherapy; ECA, external carotid artery; ICA, internal carotid artery; M, male; NBCA, n-butyl cyanoacrylate; NPC, nasopharyngeal carcinoma; OP, operation; RT, radiation therapy; SCC, squamous cell carcinoma; s/p, status post. Wallgraft, Boston Scientific, Marlborough, MA; Fluency Vascular Stent Graft, BARD Peripheral Vascular Inc., Tempe, AZ; Viabahn, Gore Medical, Flagstaff, AZ.

Data collection included periprocedural complications, procedure-related mortality, overall mortality/survival time, short-term and delayed complications, follow-up imaging results and clinical outcome (Table 2).

To determine the possible causes of CBS in these patients, this study also reviewed medical records and images (CT or MRI) obtained within 3 months before or after the first episode of CBS. The patients were grouped into the following three subgroups according to the suspected cause of CBS (Table 3):

- (1) Surgery-related complication
- (2) erosion of the vascular system by tumour or lymphadenopathy with extranodal extension
- (3) other (soft-tissue complication related to radiation/chemotherapy or related to infectious process).

Of the 17 patients analysed, 1 patient (Patient 3) had a surgical complication identified as a direct cause of CBS. The patient received total laryngectomy for hypopharyngeal cancer complicated with right CCA rupture. After arteriorrhaphy of the ruptured artery, a suspicious leakage was noted. Therefore, a second procedure was performed. During the second procedure, chronic infection of the surgical site and poor wound healing were observed. Unfortunately, the second surgery did not successfully resolve the pseudoaneurysm. Thus, CSP was arranged for this patient.

In the other 16 patients, the cause was characterized according to CT or MRI findings. The images were compared with vascular lesions noted in angiography. A recurrent/residual tumour or metastatic lymph node abutting/encasing the target vessel was assumed to be a direct cause of invasion or erosion. 11 patients were categorized into this group. The remaining five patients were subgrouped as "other" [either post-concurrent chemotherapy (CCRT) change or infectious process near the vessels].

Interventional procedure

During the procedure, blood pressure, oxygen saturation, respiratory rate and electrocardiography results were continuously monitored. Informed consent was obtained from the patient or patient's legal representative. Lidocaine hydrochloride was locally injected with or without narcotic analgesics before attempting the arterial approach. To access the common femoral artery, a femoral

sheath was securely inserted by Seldinger technique. All catheters were flushed with heparinized saline. Aortography was performed with a pigtail catheter. Diagnostic neuroangiography was then performed to identify suspicious vascular lesions. For patients who required CSP, a 10 French guiding catheter was navigated to the suspicious vascular lesion. A covered stent or stent graft (Wallgraft™/Boston Scientific, Marlborough, MA, Fluency® Vascular Stent Graft/BARD, Tempe, AZ, Viabahn®/Gore®, Flagstaff, AZ) was then introduced across the lesion site.

The size and length of the stent depended on the length, location and internal diameter of the target vessel. The distal end of the stent graft was placed >1 cm above the suspicious lesion. After placement of the stent graft, angiography was performed to confirm the position and patency of the stent graft and to identify other vascular lesions. All procedures were performed under biplane fluoroscopic angiography. After the procedure, clopidogrel 75 mg and aspirin 100 mg per day were prescribed for 3 months. After 3 months, 100 mg aspirin per day was prescribed for life.

RESULTS

Most of the 17 patients with HNC in this study had squamous cell carcinoma; the remaining patients had nasopharyngeal carcinoma ($n = 1$), papillary thyroid cancer with local metastasis ($n = 1$) and double cancer (oropharyngeal spindle cell carcinoma of the hard palate combined with supraglottic squamous cell carcinoma) ($n = 1$).

Clinical presentations of CBS included active bleeding from the wound, haemoptysis/oral bleeding, nasal bleeding/epistaxis and bleeding from tracheostomy or fistula.

The angiographic findings included contrast extravasation or pseudoaneurysm (Figure 1) involving the CCA ($n = 4$), the external carotid artery and its branches ($n = 9$) or the ICA ($n = 4$).

The initial angiography success rate was 100%. No contrast filling of the pseudoaneurysm and no active contrast extravasation were noted.

Procedural or periprocedural complications were noted in 2 patients (12%; Patients 4 and 9) of the 17 cases. Both suffered from cerebral vascular accident (CVA).

Table 2. Treatment result and complication noted during follow-up

Patient number	Procedural or periprocedural complication	Procedural mortality	Re-bleeding	Other complication	Image (angiography, CT), longest follow-up for stent patency	Clinical follow-up time	Cause of death or result in clinical follow-up
1	(-)	(-)	(-)	(-)	31 months, stent patent	33 months, expired	Expired owing to primary disease
2	(-)	(-)	(-)	Asymptomatic in-stent thrombosis after 8 months	8 months	7 years 6 months, still alive	
3	(-)	(-)	7 months (211 days) later, neck wound bleeding	Suspect abscess formation adjacent to the stent, 10 months later	10 months, patent stent	11 months, expired	Expired owing to trauma
4	Confusion with hypotension during the procedure; suspect acute stroke	(-)	(-)	(-)	Nil	1 month, expired	Expired owing to primary disease
5	(-)	(-)	(-)	Suspect abscess formation adjacent to the stent, 2 months later	2 months, patent stent	3 months, expired	Uncertain cause of death
6	(-)	(-)	(-)	4 days, infarct in the bilateral parieto-occipital lobes, may be related to previous shock status	Nil	<1 month, expired	Expired owing to primary disease
7	(-)	(-)	(-)	(-)	Nil	<1 month	Lost to follow-up in <1 month
8	(-)	(-)	Readmission <1 month later owing to rebleeding (28 days); rebleeding again 2 months later, expired	(-)	Nil	2 months, expired	Expired owing to rebleeding
9	Bilateral leg and right limb weakness after the procedure; CT: suspect acute infarct in the right frontal, left frontal, parietal, temporal and insular lobes	(-)	<1 month (17 days), oral bleeding	(-)	(-)	3 months	Lost to follow-up after 3 months

(Continued)

Table 2. (Continued)

Patient number	Procedural or periprocedural complication	Procedural mortality	Re-bleeding	Other complication	Image (angiography, CT), longest follow-up for stent patency	Clinical follow-up time	Cause of death or result in clinical follow-up
10	(-)	(-)	Rebleeding 6 months (195 days) later; angiography revealed another pseudoaneurysm from left superior thyroid artery	Stent occlusion <1 month, with infarction involving the left lentiform nucleus and caudate nucleus	Stent occlusion <1 month	7 months, expired	Expired owing to rebleeding
11	(-)	(-)	Rebleeding <1 month (28 days) later; received treatment in other hospital; rebleeding again 2 months later	Infarction, 2 months later	1 month, stent patent	2 months, expired	Expired owing to rebleeding
12	(-)	(-)	(-)	Asymptomatic in-stent thrombosis, 2 months later	Two months later, in-stent thrombosis	12 months, still alive	Still alive
13	(-)	(-)	(-)	(-)	(-)	13 months	Lost to follow-up after 13 months
14	(-)	(-)	<1 month (22 days) oral bleeding; angiography: no active bleeder	(-)	1 month, stent patent	4 months	Uncertain cause of death
15	(-)	(-)	Rebleeding 2 months (63 days) later	<1 month, right side weakness; CT: acute infarct in the left MCA territory	(-)	2 months, expired	Expired owing to primary disease
16	(-)	(-)	(-)	1 month later (30 days), right limb weakness + no verbal output, acute infarct in the left MCA territory, total occlusion of the left ICA, MCA	1 month later, total occlusion of the left ICA, MCA	Follow-up for 9 months	Still alive
17	(-)	(-)	Rebleeding more than 1 month (37 days) later	(-)	(-)	2 months, expired	Expired owing to primary disease

ICA, internal carotid artery; MCA, middle cerebral artery.

Table 3. The suspected causes for carotid blow-out syndrome

Cause for carotid blow-out syndrome	Number of patients
Surgical complication	1
Direct invasion by tumour or extracapsular spread of metastatic lymph node	11
Other	5

In one patient (Patient 4), hypotension with change of consciousness was noted during the procedure. After fluid challenge for hypotension, his blood pressure stabilized, but mild conscious disturbance with right hemiplegia persisted. After consultation with a neurologist, acute infarct was suspected. His consciousness level returned to normal, but right-side weakness persisted during hospitalization.

Another patient (Patient 9) who suffered transient loss of consciousness during the procedure required mechanical ventilation via a pre-existing tracheostomy. Upon regaining consciousness, the patient had weakness in both legs, weakness in the right upper arm and extraocular motilities gazing toward the left side. After consultation with a neurologist, the patient was transferred to the neurological intensive care unit for further management of suspected left middle cerebral artery infarct. Follow-up brain CT revealed scattered hypodense lesions involving the right frontal, left frontal, parietal, temporal and insular lobes (Figure 2). After 1 week, the patient was successfully weaned from mechanical ventilation, and his muscle power gradually recovered. However, the patient still exhibited mild aphasia during follow-up.

As of June 2014, the total follow-up time after the procedure ranged from 7 days to 7 years, 6 months. Three patients were lost to follow-up. Of the remaining 14 patients, 11 patients died during follow-up. Complications at follow-up were categorized as short-term complications if they occurred within 30 days after stent graft placement.²

Figure 1. Patient 12. (a) Right common carotid artery (RCCA) angiography revealed a pseudoaneurysm with active contrast extravasation (arrow). (b) Post-stenting angiography revealed no more pseudoaneurysm/active bleeding.

Figure 2. Patient 9, transient loss of consciousness during the procedure, with bilateral leg and right upper limb weakness after regaining consciousness. Non-enhanced brain CT revealed hypodense lesions in the bilateral hemisphere; suspect acute infarct.

Eight (47%) of the cases had short-term complications, including four cases with rebleeding (Patients 8, 9, 11 and 14) and four cases with CVA (Patients 6, 10, 15 and 16) (Figure 3); stent occlusion was documented in two of the four CVA cases.

Nine cases had medium-term/chronic complications, including two (12%) cases with asymptomatic in-stent thrombosis (Patients 2 and 12; Figure 4), one (6%) case with symptomatic CVA (Patient 11), two (12%) cases with suspected abscess formation adjacent to the stent graft (Patients 3

Figure 3. Patient 16, acute onset of no verbal output and right limb weakness, 30 days after stent placement. (a, b) DWI and ADC map revealed acute infarct involving the vascular territory of left middle cerebral artery. (c) Time-of-flight MR angiography revealed suspicious total occlusion of the left internal carotid artery and middle cerebral artery. A, anterior; ADC, apparent diffusion coefficient; DWI, diffusion weighted imaging; L, left; P, posterior; R, right.

and 5; Figure 5) and four (24%) cases with rebleeding (Patients 3, 10, 15 and 17).

According to the literature (Table 4⁴⁻⁸), rebleeding is the major complication of CSP and is potentially fatal. In our study, rebleeding was noted during follow-up in eight (47%) cases. Three of the eight patients with rebleeding (Patients 8, 10 and 11) eventually died, which accounted for 27% of the all-cause mortality (3/11). Of the three patients who died, one patient (Patient 10) had pseudoaneurysm.

Patient 10 was a case of nasopharyngeal non-keratinizing carcinoma Stage III (T2bN2Mx) involving the right neck post surgery, chemotherapy and radiotherapy. The patient was sent to our emergency department in March 2013 for acute nose-bleed upon waking up in the morning. A review of his history revealed intermittent epistaxis for 3 days. After the patient received tracheostomy in the emergency department, the patient was transferred to our department for further management.

Emergent angiography revealed suspicious vasospasm with near occlusion of the right ICA. Contrast extravasation was noted in the middle portion of the right ICA (Figure 6a). Prominent collateral circulation of the right middle cerebral artery was noted from the contralateral ICA/anterior carotid artery via the anterior communicating artery. After using an Amplatz exchanging wire to navigate the right carotid canal, a covered stent (Wallgraft 8 × 70 mm; Boston Scientific) was deployed with the upper end meeting the orifice in the skull base and the lower end in the right CCA. Although a slow flow through the covered stent was noted, patency of the intracranial arteries was achieved. A further angiography revealed no further contrast extravasation (Figure 6b).

Although the procedure successfully achieved haemostasis, left upper arm weakness occurred 4 days later. After consultation with a neurologist, a carotid artery duplex scan was performed, which revealed possible total occlusion of the carotid artery. Follow-up brain CT and MRI revealed infarction involving the right lentiform nucleus and caudate nucleus. Medication and

Figure 4. Patient 12. (a) Post-contrast-enhanced axial CT revealed suspicious poor pacification of the right thrombosed stent (arrow) compared with normal left internal carotid artery (open arrow). (b) Three-dimensional volume-rendering CT angiography demonstrated the position of the stent well (open arrow). A, anterior; F, foot; H, head; L, left; P, posterior; R, right.

Figure 5. Patient 3 (a, b) Contrast-enhanced axial and coronal CT images revealed rim-enhanced lesions with internal air bubbles (arrows) adjacent to the stent graft; suspect abscess formation.

rehabilitation were arranged. After 1 month of hospitalization, the patient stabilized and was discharged.

During follow-up in the outpatient department, the patient was admitted several times for cancer treatment. During the treatment course, progression of a recurrent tumour involving the bilateral pharynx was noted.

During a hospital admission 6 months later, nosebleed and bleeding from the tracheostomy were noted. The bleeder could not be visualized clearly by fibroscope. Angiography revealed occlusion of the previous covered stent in the right CCA/ICA and a pseudoaneurysm in the inferior aspect of the right mandibular angle with a feeding artery from the left superior thyroid artery was also noted (Figure 6c). Endovascular treatment was suggested. However, the legal guardians preferred palliative care rather than further treatment, and the patient expired several days later.

DISCUSSION

This retrospective study presents a relatively large group of 17 patients who had received CSP for HNC complicated by CBS.

Table 4. Rebleeding-related mortality and all-cause mortality

Author	Total number of patients	All-cause mortality	Mortality related to rebleeding
Pyun et al ⁴	7	3	0
Chang et al ⁵	11	9	2
Warren et al ⁶	3	2	1
Simental et al ⁷	2	2	0
Hakime et al ⁸	20	14	5
Our cases	17	11	3

A CBS is a rupture of the carotid artery or its major branches. The current classifications for this syndrome are threatened, impending and acute.⁹

The clinical manifestations range from acute haemorrhage to asymptomatic exposure.

A CBS is usually lethal in patients with HNC. The cause of the syndrome could be the tumour itself or the treatment modality.^{10,11}

For 11 of the 17 patients analysed in this study, the suspected cause of the initial episode of CBS was either direct invasion of the vessel by the tumour or extracapsular spread of the metastatic lymph node. One case suffered from CBS as a result of surgical complications. In the remaining five patients subgrouped as “other”, the suspected cause was soft-tissue complications near the vessel (post radiation therapy/CCRT change, adjacent infectious/inflammatory process).

Treatment options for CBS include surgical ligation and endovascular treatment.⁹

Surgical ligation is the definitive treatment option for a ruptured carotid artery; however, previous radiation therapy and the presence of a primary malignancy increase the relative difficulty of further surgical intervention. The high risk of stroke and related mortality in these patients makes surgery even more challenging.

Balloon occlusion, coil embolization and CSP are reportedly effective endovascular treatments.

A CPS is considered a quick and effective treatment option for CBS and has a high rate of success in achieving initial haemostasis.¹²

In our patients, the initial angiographic success rate was also high at 100%. No contrast filling of the pseudoaneurysm and no active contrast extravasation were noted in the post-procedural angiography.

Figure 6. Patient 10 presented with active bleeding from nose. (a) Right common carotid artery (RCCA) angiography revealed active contrast extravasation from cervical portion of the right internal carotid artery (RICA) (arrow). (b) Post-stenting RCCA angiography revealed no more active bleeding. (c) 6 months later, rebleeding from the tracheostomy and angiography revealed a pseudoaneurysm in the inferior aspect of the right mandibular angle with feeding artery from the left superior thyroid artery. LCCA, left common carotid artery.

Although CSP is considered a safe and effective treatment for CBS, reported complications include recurrent bleeding, endoleak, stent infection, stent extrusion, in-stent thrombosis and CVAs.^{1,12}

Additionally, the optimal conditions for CSP include favourable vascular access with no complication of the aortic/supra-aortic vasculature and a favourable puncture site (typically the femoral artery).

For pathologic vascular lesions, a pre-existing stenosis may further hinder placement and expansion of the covered stent, which makes the procedure even more challenging. If infection and necrosis occur near the vascular lesion, a CSP may be associated with a long-term infection, even brain abscess formation.¹³

The CSP achieved initial haemostasis in all patients in this study, and no procedure-related deaths occurred.

Chang et al¹ have reported that in patients with HNC, stent grafts can immediately achieve initial haemostasis after CBS. Immediate haemostasis was achieved in all eight of their patients with CBS. Initial complications included two asymptomatic thrombosis and one acute stroke; unfortunately, the long-term outcomes were poor. Delayed complications included rebleeding ($n = 4$), carotid thrombosis ($n = 3$) and brain abscess formation ($n = 1$).

In our study, eight cases suffered rebleeding after CSP; the mean time between CSP to the first rebleeding episode was 74.1 days, which was slightly longer than the mean time of 24.5 days reported in a previous study.¹²

A CPS is only a vascular treatment intended to achieve haemostasis. It does not treat the underlying HNC. As the underlying malignancy progresses, further erosion of the pathologic artery

across the covered stent can cause rebleeding.¹ Other potential contributors to disease progression include continuous radiation therapy, ongoing infectious process near susceptible vessels or poor tissue health resulting from cachexia.

Two of the patients in this study (Patients 3 and 5) had suspicious abscess formation adjacent to the stent graft.

As mentioned above, a suspicious infectious process near the vascular lesion was noted in Patient 3 during a previous arteriorrhaphy. Although CSP was performed in a contaminated area, it successfully achieved haemostasis in this patient. Abscess formation adjacent to the stent was noted during follow-up.

Besides the fact that vascular lesions often occur adjacent to necrotic tissue/tumours in patients with CBS, ongoing therapies (e.g. chemotherapy, radiation therapy, surgery etc.) and the terminal status of these patients contribute to poor host immunity.

In this situation, the risk of persistent infection is high. Medication alone may be insufficient to cure the colonized infection, and surgical retrieval of an infectious stent may be required.³ In addition to localized abscess formation adjacent to the stent graft, distal embolization resulting in cerebral abscess and carotid thrombosis have been reported.¹³ Prophylactic antibiotics may be needed if CSP is performed under these conditions.⁶

The covered stent itself is considered thrombogenic.¹⁴ Susceptibility to CVA is increased in patients who have acute hypovolemia related to blood loss, patients who have poor nutrition and patients who have difficulty with oral intake in the chronic setting. Of the nine patients in this study, two patients had asymptomatic stent thrombosis (Patients 2 and 12) and seven

patients had symptomatic CVAs (Patients 4, 6, 9, 10, 11, 15 and 16). In Kaohsiung Medical University Chung-Ho Memorial Hospital, all catheters are continuously flushed with heparinized saline during use. After the procedure, oral antiplatelet medication is initiated when haemostasis is achieved. The suggested medication is dual antiplatelets for 3 months and then aspirin alone for life. In some cases, e.g. rebleeding, the clinician may discontinue the medication. However, the use of antiplatelet agents in HNC with CBS remains debatable. Pre-medication for these patients is almost impossible under such emergent conditions. The key consideration is when antiplatelet regimens should be prescribed after the procedure. To prevent in-stent thrombosis, combined dual antiplatelet therapy with aspirin and clopidogrel is required for at least 3 months after CSP.¹⁵ According to the literature, however, antiplatelet agents are not routinely used owing to rebleeding risk.¹²

The overall mortality in this study approximated 79% (11 of 14), which was lower than that reported in previous studies.²

Some limitations of this study are noted. First, since this was a retrospective study, the possibility of bias cannot be excluded. Second, the short life expectancy of patients with HNC with CBS made long-term follow-up difficult. Third, although this study analysed a relatively larger number of cases compared with previous studies, further studies of larger populations and a control group are encouraged.

In conclusion, CSP is generally an effective method for achieving haemostasis in selected patients. Although 100% of the patients in this study achieved initial haemostasis, the high risk of rebleeding, CVA, stent infection and other medium- to long-term complications are likely to result in poor long-term outcomes. Thus, rather than a definitive treatment, this procedure should be considered a temporary life-saving treatment for achieving haemostasis in emergent settings. After the procedure, detailed follow-up and imaging are recommended to assess stent patency, progression of primary disease, possible stent infection or other complications. Prophylactic antibiotics combined with dual antiplatelets might be helpful, but further investigation is needed.

CONCLUSION

Although CSP is considered as an effective method of achieving haemostasis in patients with HNC with CBS, long-term outcomes are often poor because of the high risk of rebleeding, CVA, stent infection and other medium- to long-term complications. This procedure should thus be considered a temporary life-saving technique rather than a definitive treatment. Although a combined therapy including prophylactic antibiotics and dual antiplatelets might be needed after CSP, further studies in larger populations are needed. After CSP, close follow-up and imaging are recommended.

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