

Bleeding In Head And Neck Malignancy : Institution Based Management And Review

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Research

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Abstract

Introduction:

Squamous cell carcinoma constitutes for >90% of head and neck cancers. Acute rupture of irradiated, large vessels is life-threatening complication. The distribution of bleeding foci is diverse and can range from internal or common carotid arteries to branches of the external carotid artery. We intend to assess the management of patients presented in our institution with such acute bleeding episodes and also review the management of carotid blowout syndrome which is an oncological emergency.

Methods:

Retrospective observational study of 27 cases presented in our institution with acute bleeding due to head and neck cancer for period of two years. After resuscitation and necessary consents, emergency open tracheostomy was done with universal precautions. ECA/CCA ligation was done. All the patients were started on low molecular weight heparin 8 hours post surgery. Therapeutic outcomes were assessed based on simple frequencies and proportions.

Results:

Of the 27 cases presented in our institution, 19 of them underwent ECA ligation while 8 of them CCA ligation for the control of active bleeding. 12 of 27 patients were receiving definitive chemoradiation of which 7 of them were ongoing. Remaining 15 patients were receiving adjuvant radiotherapy following surgery. 19 patients who underwent ECA ligation, had no further bleeding episodes. 8 patients who underwent CCA ligation, had only wound related complications and none of them had neurological deficits. 11 patients were operated during covid-19 period. 4 patients turned out covid positive. None of the medical personnel contacted the infection.

Conclusion:

Radiotherapy is one the major contributor for CBS. Endovascular procedures can be used for local tumour bleed, threatened, impending and stable acute CBS. Surgical CCA ligation done in bleeds unsuccessful by endovascular procedure and in acute unstable CBS. ECA ligation is safe and effective method to control local tumor bleed. Surgical finesse, careful planning, adherence to universal precautions and institutional protocol can reduce Covid-19 transmission to medical personnel in this testing times.

Introduction:

Squamous cell carcinoma (SCC) constitutes for > 90% of head and neck cancers with significant increase in the incidence in Indian subcontinent. It accounts for approximately 30–40% of all cancer sites.¹ There are varied treatment protocols for SCC head and neck cancers viz. surgery, chemo-radiation, based on the stage presented by the patient. One of the major complication seen in head and neck cancers is intractable hemorrhage from local tumor irradiation or spontaneous tumor bleeding.² Acute rupture of

irradiated, large vessels is life-threatening complication.³ The distribution of bleeding foci is diverse and can range from large vessels, such as the internal (ICA) or common carotid arteries(CCA), to small branches of the external carotid artery (ECA). Focal area or active bleeding from branches of ECA can be managed with ECA ligation where as bleeding from CCA termed as carotid blowout syndrome (CBS) is varied and is based on its classification i.e. threatened, impending or acute.⁴ So identification of the location is pertinent for effective management of the bleeding complication. In this paper, we intend to assess the management of patients presented in our institution with such acute bleeding episodes and also review the management of CBS which is an oncological emergency.

Methods:

This is a retrospective observational study of 27 cases of patients presented in our institution with acute bleeding due to head and neck cancer from November 2018 to October 2020. Patients who were diagnosed with SCC head and neck cancer either undergoing or had completed their with palliative or curative intent presenting with intractable local hemorrhage and acute CBS were considered in this study. These patients were resuscitated in the emergency department, received local compression and were shifted to the operation theatre after withdrawing blood samples for blood requirement and nasal swabs RT-PCR test for 11 patients presented during Covid-19 period (March 2020 – October 2020). As per institutional protocol, consent for CCA ligation and resultant possibility of stroke/morbidity/mortality were taken, universal precautions were followed and PPE kit along with powered air purifying respirator (PAPR) was worn for all the cases emergency tracheostomy was done in all the patients to prevent aspiration and save valuable time in intubating difficult airway together with active bleeding/clots in the airway of the patient. Blood was invariably transfused to the patient once reports were available. Based on the location/blood vessel bleed, decision of either ECA/CCA ligation was done with silk 2 – 0 after raising subplatysmal flaps and retracting internal jugular vein laterally. All the patients were started on low molecular weight heparin 8 hours post surgery. Therapeutic outcomes were assessed based on simple frequencies and proportions. Post treatment patient was resumed their treatment protocol based on institutional tumour board decision.

Results:

Of the 27 cases presented in our institution, 17 were male and 10 female with mean age being 35.3 years.19 of them underwent ECA ligation while 8 of them CCA ligation for the control of active bleeding with the primary tumour distribution as in Table 1. 12 of 27 patients were receiving definitive chemoradiation of which 7 of them were ongoing. Remaining 15 patients were receiving adjuvant radiotherapy following surgery.

Table 1
PRIMARY TUMOUR DISTRIBUTION

Distribution of the primary tumour			
	Number	ECA Ligation	CCA ligation
Oropharynx	6	3	3
Tongue	2	2	0
Floor of the mouth	3	3	0
Hypopharynx	5	0	5
Laryngeal	2	2	0
Hard palate	2	2	0
Lower alveolus	1	1	0
Buccal mucosa	1	1	0
Combined	3	4	0
CUP syndrome	1	1	0
Total	27	19	8

19 patients who underwent ECA ligation, had no further bleeding episodes with no morbidity and recovered immediately after post-op. 8 patients who underwent CCA ligation, had wound related complications in 5 of the patients which required regular dressings and coverage by local flaps on the later date. None of the patients who underwent CCA ligation developed neurological deficits. However on follow up, 3 of them passed away at the local hospital due to massive recurrent CBS following months of CCA ligation. 11 patients were operated during covid-19 period (March 2020 – October 2020). 3 of them had undergone CCA ligation while the remaining 8 underwent ECA ligation. 4 patients turned out covid positive. Medical personnel who operated/assisted these procedures were evaluated and none of them contacted the infection.

Discussion:

Bleeding is a most common complication during head and neck surgical procedure but major tumour site bleed or acute CBS warrants emergency care to prevent immediate mortality. Acute and torrential bleed in head and neck cancer patients requires ECA ligation if the bleed is in tumour site and region supplied by ECA or CCA ligation if it is CBS. Over all incidence of CBS in head and neck surgery patients is between 3-4.5%.⁵ Based on literature, its incidence varies based on patients clinical scenario, post-operatively its incidence increases to 4.5–21.1% in previously irradiated patients, while in radiotherapy naïve patients, its 0–2.4%.^{6,7}

Various causes have been attributed for CBS, one of them being considered as radiotherapy. Radiation has proven to generate free radicals which lead to obliteration of vasa vasorum of the arterial adventitial layer by forming thrombosis thereby fibrosis and weakening of arterial wall. Due to the focal ischemia, there's formation of pseudoaneurysms, radiation induced necrosis and spontaneous rupture of the artery.⁸ Studies have shown that previously irradiated patients increases CBS by 7.6 fold post-operatively.⁹ Also studies by Gall et al. and Krause et al. concluded that pre-operative radiotherapy when given in moderate doses (< 45 Gy) increases possibility of CBS by 2.7-3%.⁶ It has also been reported that 80–90% of patients with CBS, has a prior radiotherapy history giving a precedence that radiotherapy is the main predisposing factor for CBS and possibility increases further during salvage surgery.¹⁰ Studies have shown that tumour infiltration of the carotid wall together with surrounding inflammation or tumour encasement of > 180° circumference of carotid wall, have more possibilities of developing CBS. As these disease condition requires higher radiation it ends up with weakening of carotid wall as disease responds to radiation making it prone for CBS.^{11,12} Patients receiving hypofractionated stereotactic radiotherapy (hSRT) and stereotactic radiosurgery (SRS) modalities of therapy have a higher risk of CBS when compared to intensity-modulated radiation therapy (IMRT) which may be due to increased biological efficacy of higher radiation doses per fraction while on the contrary fractionation schedule did not have an influence on the development of CBS with 16% chances of CBS on daily basis and 12.5% on alternate days.^{13,14}

Surgically stripping of the carotid sheath during neck dissection compromises the nutrition of the carotid artery and renders the carotid artery more prone for CBS on a later date due to lack of supporting healthy tissues.¹¹ Bacterial infection secondary to surgical site infection (SSI) increases the effects of local inflammatory mediators and also induces thrombosis of vasa vasorum. When coupled with oro-cutaneous/pharyngo-cutaneous fistula communicating to neck, it leads to digestion and dissection of adventitia and gradual erosion.¹⁵ Surgical complications like surgical site infection (SSI) and fistula needs to be dealt the earliest to avoid immediate post op CBS.

60–70% CBS occurs in predominantly at the bifurcation of CCA and in fewer cases in ICA usually 40–90 days after surgery or radiation. 2% of cases it can occur bilaterally. In our study, all the patients who underwent CCA ligation had CBS at CCA bifurcation. CBS can be classified into acute, impending and threatened. Threatened (type I) CBS are characterized by exposure of carotid artery on examination or imaging. Impending (type II) blowouts are the conditions where there are sentinel bleeding episodes which controlled with compressions and regular dressings. Acute carotid hemorrhage (type III) is sudden give away of the carotid wall secondary to infection/necrosis is associated with high rates of mortality. Study by Liang et al. reported that 8%, 24% and 68% presented with threatened, impending and acute CBS respectively.¹⁶ Recurrent CBS refers to repeated episodes of bleeding occurring in the same vessel which had been previously intervened and can be considered as treatment failure if occurred in the same site or progressive disease if occurred in different site of the same arterial segment. Recurrent CBS incidence can be 35–65% with duration varies from 1–6 months of previous ligation.^{16,17} In our study, all the patients presented with acute bleed which necessitated immediate surgical intervention to avoid

mortality. Of the 8 patients who underwent CCA ligation, 3 patients mortality due to recurrent CBS at their hometown. Surgical wound dehiscence, radiation-induced arteriopathy, musculocutaneous flap necrosis or tumor invasion into the vessel are considered as the possible causes for recurrent CBS.¹⁷

Acute CBS is an oncological emergency where patient presents with torrential hemorrhage secondary due to loss of CCA wall and would result in mortality in 40% of cases if not surgically intertwined.¹⁸ 10–20% of patients develop permanent neurological sequelae and 30–40% remain asymptomatic.¹⁹ 8 patients in our study underwent emergency CCA ligation and post-operatively didn't have any neurological sequelae. This could be due to development of collateral blood flow by contralateral CCA or by ipsilateral ECA/vertebral arteries to the Circle of Willis.²⁰ Risk of morbidity increases if the patient is in hypotension, so its pertinent to address the blood pressure with adequate resuscitation and further delay the neurological sequelae by substituting low dose heparin 8 hours after ligation.⁶

Endovascular management in CBS has received precedence in recent years for control of bleed and reconstructing damaged arteries in threatened, impending and stable acute bleeds. Gold standard for diagnosing threatened and impending CBS is digital subtraction angiography (DSA) for assessing arterial wall irregularity/rupture, luminal stenosis, pseudoaneurysm and contrast leak.²¹ Embolisation of ECA for the stable local tumour bleeds can be performed by deploying materials like microparticles or microcoils through mircocatheters.²² But for CCA bleed either endovascular occlusion or endovascular repair with covered stents is done. Endovascular occlusion by Amplatzer Vascular Plug is done in patients with complete circle of Willis and adequate contralateral flow which is ascertained by prior DSA and Balloon Occlusion Test for 30 minutes where neurological assessment is done for every 3–5 minutes.²³ Patients who fall short of these tests and with deficient carotid wall are planned for Polytetrafluoroethylene-covered nitinol stent grafts.²⁴ Patients who undergo endovascular procedure would receive lifelong antiplatelet drugs. As per study by Chang et al., neurological sequelae associated with endovascular embolisation is 8–14%, rebleeding rates with embolisation and covered stents are 11–21% and 25–85% respectively.²⁴

11 patients were operated during covid-19 period (March 2020 – October 2020). All of these patients underwent RT-PCR test for Covid-19.

Since our center is marked as Red Zone hospital, all the necessary universal precautions with minimal handling like compression packing to the bleeding site was followed. Considering the possibility of 1 in 5 false negative rate of the test, universal precautions with PPE kit and usage of PAPR was done in all emergency cases.²⁵ Open tracheostomy was preferred in a negative pressure, reverse laminar flow operation theatre as it is an aerosol generating procedure with minimal personnel in the theatre.²⁶ Cautery usage was discouraged and bloodless field was tired to be achieved during the procedures. Since 4 patients turned out to be positive, medical personnel involved in those cases were quarantined but on further testing none of personnel turned positive.

Conclusion:

Bleeding is one most common complication in head and neck cancer treatment and can be life threatening if its acute CBS. Radiotherapy is one the major contributor for CBS. Endovascular procedures has gained prominence for management of local tumour bleed, threatened, impending and stable acute CBS. Surgical CCA ligation can be done in bleeds unsuccessful by endovascular procedure and in acute unstable CBS. Complications surgical CCA ligation varies in different studies and none of them in our retrospective observational study. ECA ligation is safe and effective method to control local tumor bleed. All the patients require to undergo emergency open tracheostomy to save the valuable time. Surgical finesse, careful planning, adherence to universal precautions and institutional protocol can reduce Covid-19 transmission to medical personnel in this testing times.

Declarations

- Ethics approval and consent to participate – Not applicable
- Consent for publication – Yes from the authors, none of the patients pictures has been enclosed
- Availability of data and materials - Yes
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- Authors' contributions

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