

CASE REPORT

Carotid Body Tumour Excision: A Case Report of Anaesthetic Challenges in A Regional Hospital in South-East Nigeria

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Received: April 10th, 2020

Accepted: June 15th, 2020

DISCLOSURE

Conflict of interest: Nil

Funding: Nil

ABSTRACT

Carotid body tumour is an uncommon tumour with potential to cause marked haemodynamic instability intraoperatively and turbulent post-operative recovery. A carefully planned anaesthesia is very important for a successful peri-operative management.

We report a case of a 44-year-old male that had carotid tumour excision under general anaesthesia. Nitroglycerin was used for hypotensive anaesthesia. Patient was electively ventilated post operatively in the Intensive Care Unit (ICU). Anaesthetic challenges encountered were discussed

Key words: Neck, Paraganglioma, Resection, General anaesthesia

INTRODUCTION

The carotid body is a structure usually located within the adventitia of the common carotid artery at the inferomedial aspect of the carotid bifurcation.¹ Its function includes chemo- and baroreception which regulates the heart rate and blood pressure. Carotid body tumours (CBT) arises from glomus cells within this structure; they are rare neoplasms present

in about 60-70% of head and neck paraganglioma.² They develop with adventitia of the medial aspect of carotid bifurcation with characteristic splaying of the Internal and external carotid arteries (Figure 1).³

Carotid body paragangliomas are typically painless, slow growing tumors. It is usually located within the carotid sheath, anterior to

the sternocleidomastoid muscle near the angle of the mandible at the level of the hyoid bone. It is mainly a benign tumour but malignant transformation is encountered in 2-36% of cases.²

Surgical resection of this neoplasm is the treatment of choice to avoid local spread and metastasis.^{3,4} However this is very challenging to both the surgeon and the anaesthetist, as the tumour is highly vascular and the cranial nerves IX, X, XI and XII are close to it in the carotid sheath.³ The CBT may synthesize and secrete catecholamines, although this is less common than with adrenal para-gangliomas such as pheochromocytoma.⁵ Therefore perioperative rise in blood pressure coupled with the vascular nature of the tumour could result in massive blood loss.

This case report is presented in order to bring to the fore the anaesthetic challenges encountered during the perioperative management of this case and the steps taken to overcome them. The anticipated labile blood pressure and potential for massive blood loss especially due to iatrogenic vascular injury to the carotid artery is also discussed.

CASE SUMMARY

This is a 44-year-old man who had a left neck mass of 9 years' duration, initially painless and the size of the distal phalanx of the patient's thumb but gradually increasing in size in the last 3 years with associated dull pain. There was associated impairment in hearing of the left ear with occasional vertigo and tinnitus. Six months prior to presentation, he developed left facial nerve lower motor neuron palsy and hoarseness of the voice.

Patient smoked a packet of cigarette a day but stopped a year before presentation.

On physical examination, he was not pale, afebrile and had no peripheral lymphadenopathy. Pulse rate was 92 beats/min, full volume and regular. The blood pressure was 120/70 mmHg. The hemispheric mass measured 6x4 cm, located at left lateral aspect of upper 1/3rd of the neck with distinct carotid pulsation. It was not tender and occupied both the anterior and posterior triangles of the neck.

The chest radiograph showed normal findings. Computer tomography (CT) scan showed a well-defined solid non-homogeneously isodense mass in the left carotid space. The mass has both infra and supra hyoid component and had splayed the carotid bifurcation with displacement of the external carotid artery. The mass measures about 165 x 60 x 40 mm in size. No extension into the base of the skull or intracranial component was seen. No cervical lymphadenopathy was evident. The CT angiography of the carotid artery was strongly suggestive of carotid body tumour (Figure 1). Full blood count showed Haemoglobin level of 12.9 g/dl, White blood cell count of $5.4 \times 10^9/L$ and platelet count of $186 \times 10^9/L$.

Airway assessment was Mallampati grade 2 and patient was assigned American Society of Anesthesiology physical status (ASA) II and anaesthetic plan was then formulated. Informed consent was obtained from patient. Diazepam and omeprazole 40 mg were given as premedication the night before surgery.

In the theatre, standard monitors were connected (Capnograph, Non-invasive blood

pressure, Pulse oximeter and Electrocardiogram). Two 16 G sized peripheral intravenous access were secured on the right and left forearm. Anaesthesia was induced with Propofol 150mg and fentanyl 80ug after the patient was preoxygenated with 100% oxygen for 3 minutes. Endotracheal intubation was facilitated by administering intravenous (IV) suxamethonium 100mg; after generalized muscle fasciculation and relaxation 7.5mm ID Armored endotracheal (ET) tube was inserted into the trachea. Patient was connected to anaesthetic machine, proper placement of ET tube was ascertained using the capnograph, and the ET tube was secured with adhesive tape. Anaesthesia was maintained with Isoflurane 1-1.5vol% and 50% oxygen in air mixture. Muscle relaxation was achieved using IV pancuronium 6mg initially and 2mg given in intervals as needed. Fentanyl 100ug was administered as analgesic, and boluses were given in intervals of 45mins.

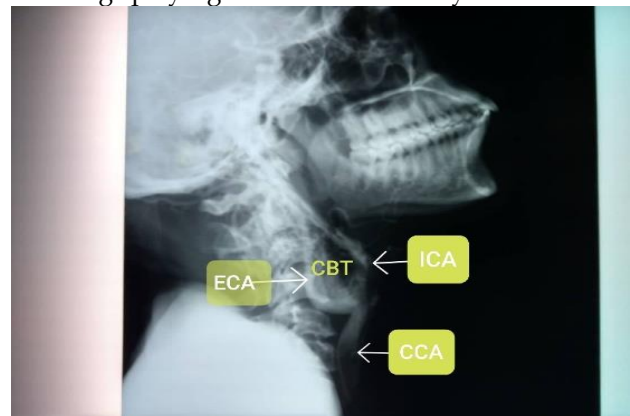
Arterial line was inserted in the right radial artery using 20gauge Teflon arterial cannula and invasive blood pressure (IBP) was monitored. Central line was inserted in the right femoral vein using a 3 lumen Central Venous Catheter (CVC).

Surgical finding were Shamblin type II carotid body tumours measuring 2x4cm at the bifurcation of Carotid artery and a base of skull tumour measuring 6x6 cm. Nitroglycerin was started 15 minutes into the surgery at an initial dose of 0.2mcg/kg/min using a syringe pump following spikes of blood pressure whenever contacts were made with the tumour and adjusted to maintain the mean arterial pressure(MAP) of 65-75mmHg. Boluses of adrenaline 50mcg was given at

every drop in blood pressure. Our target MAP was maintained for the most part throughout the surgery. Tranexamic acid 1gram was given and 3 units of cross matched whole blood were transfused intraoperatively. The estimated blood loss was 1900mls and urine output was 800mls. The surgery lasted 6 hours 10minutes and tumours were completely excised.

He was transferred to ICU at the end of the surgery where invasive and noninvasive monitoring continued, and patient was mechanically ventilated for 2 hours and later extubated fully awake. Following full recovery, the patient was transferred to the surgical ward the next day for continued post-operative care. He was discharged on the 4th day post operation with no new cranial nerve palsy. Histological report confirmed a benign paraganglioma.

Figure 1. CT angiography of the Carotid artery showing splaying of carotid vessels by the CBT



ECA - External Carotid Artery ICA - Internal Carotid Artery
CCA - Common Carotid Artery CBT - Carotid Body Tumour

DISCUSSION

Diagnosis of CBT is made by considering clinical and radiological evidences. Clinically the mass was a slow growing tumour over a

period of 9 years, located at left lateral aspect of upper 1/3rd of the neck with distinct carotid pulsation. Radiological investigations done for the patient included CT scan and CT angiography were strongly suggestive of CBT. Figure 1 (CT angiography) clearly showed the characteristic splaying of the carotid vessels (Lyre sign). Due to the vascular nature of the tumour, incision biopsy is contraindicated, and this informed the choice of surgical excision of the tumour.

Challenges encountered during anaesthesia for this patient were related mainly to control of blood pressure and maintaining our target MAP of 65-75mmHg with minimal fluctuation. This was made easier with our use of IBP monitoring which allowed for beat by beat blood pressure display and allowed us to intervene appropriately with our medications. The central venous catheter was also useful in monitoring and administering our medications ensuring rapid onset of action.⁶

The volume of blood loss during resection of the tumour can be very significant and dissection often difficult. As such, blood bank was informed and the process for rapid delivery of cross matched blood was put in place. In the index case, an attempt was made to reduce intraoperative blood loss by deploying a hypotensive agent nitroglycerin, and four units of blood were cross-matched for the surgery. The importance of nitroglycerin in inducing hypotension might be potentially problematic if there is iatrogenic vascular injury which can lead to loss of large volume of blood because of reduced vascular tone and dilatation it causes.⁷

In this case; nitroglycerin was also used to reduce the spikes in blood pressure associated with contact with the tumour. Other measures put in place for potential blood loss were insertion of 2 wide bore canulae, insertion of CVC, and a readily available pressure infusor in the event of any need for rapid fluid or blood administration. The urine output was monitored and was essentially normal.

The large volume of blood loss in this case was due to the vascular nature of the tumour and not vascular injury to the carotid artery. Bipolar electrocoagulation should be used to treat injury to the vascular wall and peripheral tissues. It is also recommended that the surgery be performed using magnification loupes in order to define the boundary of tumour mass and the vascular wall as well as the cranial nerves.⁸ This should be done to avoid excessive blood loss and nerve injury.

In this study, an armoured tube was used to help prevent the risk of kinking of the ET tube which could occur as the surgeon tries to manipulate and dissect the tumour. The surgical field interferes with the anaesthetic area (shared field), as such access to the patient's airway was limited. In addition, the use of capnography would detect any disconnection and kinking of the ET tube and the anaesthetist must be vigilant at all times to ensure that the patient is safe.

Invasive and non-invasive monitoring were continued in the ICU. The patient was electively ventilated for 2 hours in the ICU before extubation in order to allow him to be fully awake and for airway edema to subside.

Tissue handling by the surgeon is very important as patient may sustain transient injury to the cranial nerves (IX, X, XII) which may manifest as airway compromise in the immediate postoperative period. Therefore, patient must be extubated awake and closely monitored to detect any airway obstruction and prevent aspiration. The presence of cranial nerve palsy and a change in voice prior to presentation increased the risk of airway obstruction in this index case.

CONCLUSION

As this tumour is rare, knowledge about anaesthetic management of the case is essential. It is good practice to be extra prepared for the case, outline potential problems and have a plan for them if they do arise. Use of hypotensive anaesthesia, close intraoperative and invasive monitoring and elective post-operative ventilation are paramount to a good outcome. Measures must be in place for rapid blood transfusion as iatrogenic injury to the great vessels are not uncommon.

REFERENCES

1. Nguyen RP, Shah LM, Quigley EP, Harnsberger HR, Wiggins RH. Carotid Body Detection on CT Angiography. *AJNR Am J Neuroradiol* 2011; 32 (6): 1096-1099.
2. Lee KY, Oh YW, Noh HJ, Lee YJ, Yong HS, Kang EY, *et al.* Extra-adrenal paragangliomas of the body: imaging features. *AJR Am J Roentgenol* 2006; 187 (2): 492-504.
3. Wieneke JA, Smith A. Para-ganglioma: carotid body tumour. *Head Neck Pathol* 2009; 3(4): 303-306.
4. Luna-Ortiz K, Rascon-Ortiz M, Villavicencio-Valencia V, Granados-Garcia M, Herrera-Gomez A. Carotid body tumors: Review of a 20-year experience. *Oral Oncol* 2005; 41: 56-61.
5. Davidovic LB, Djukic VB, Vasic DM, Sindjelic RP, Duvnjak SN. Diagnosis and treatment of carotid body paraganglioma: 21 years of experience at a clinical center of Serbia. *World J Surg Oncol* 2005; 3(1): 10.
6. Karigar SL, Kunakeri S, Shetti AN. Anesthetic management of carotid body tumour excision: A case report and brief review. *Anesth Essays Res* 2014; 8(2): 259-262.
7. Jagtap SR, Bakhshi RG, Khatavkar SS, Phadtare SJ, Mohite SN. Carotid body tumour excision: Anaesthetic challenges and review of literature. *Indian J Anaesth* 2013; 57: 76-78.
8. Hua Q, Xu Z, Jiang Y. Diagnosis and surgical treatment of carotid body tumour: A retrospective analysis of 58 patients. *Oncol Lett* 2017; 14(3): 3628-3632.