

Necessity of adequate monitoring during carotid body tumors

Karotis tümör rezeksiyonlarında yeterli monitorizasyon gerekliliği

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Introduction

Carotid body tumors are rare, benign, vascular, slow growing and invasive to adjacent structures. The tumor originates from the neural crest paraganglion cells (1). Infiltration into the adjacent tissues and into the jugular vascular area requires surgical excision (2). During surgery intraluminal shunt procedure is usually required (3). The goal in the presentation of these case reports is to discuss preoperative angiographic findings and different monitoring options for cerebral ischemia prevention during removal of carotid body tumors (3, 4).

Case Report 1

A 34-year-old woman presented with a mass on the left side of her neck and palsy of the left upper eyelid. On examination, she had symptoms of Horner's syndrome and a pulsatile solid mass of 6 x 8 cm. A carotid arteriography revealed a classic Lyre sign (Fig. 1). During surgery, in addition to the intraoperative standard monitorization that included electrocardiogram, invasive blood pressure monitoring, pulse oximetry, temperature probe and central venous pressure monitoring, bispectral index monitoring (BIS) was added for cerebral ischemia detection. Mean arterial pressure was kept between 80 to 100 mmHg during surgery. BIS under general anesthesia ranged between 40 and 60 values. If mean arterial pressure values decreased more than 20% during intraluminal shunt, a sudden drop of BIS values ranging between 15 to 20 were recorded. This sudden drop responded to opening of the cross-clamp for several minutes, administration of fluids and packed red blood cells. This surgical and medical management caused the rise of the blood pressure and also return of the BIS values to the previous levels. Patient was extubated in the intensive care unit in 6 hours time without any complications.

Case Report 2

A 47 years old woman was found to have a carotid body tumor in an angiographic study (Figure 2a). She had persistent hypertension despite medical therapy before surgery. A solid mass of 5x3 cm was removed during tumor resection (Fig. 2b). Bispectral index monitoring (BIS) for cerebral ischemia detection was added to the standard monitoring during

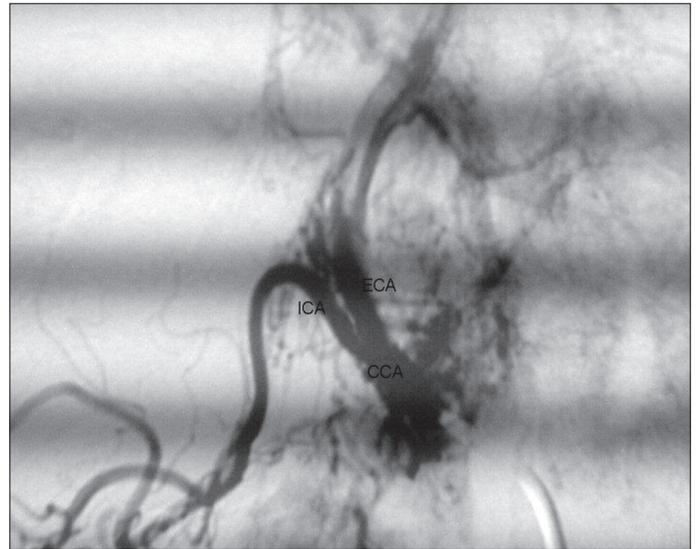


Figure 1. A classic "Lyre sign" with broad splaying of the internal and external carotid arteries was seen in carotid arteriography
CCA - common carotid artery, ECA - external carotid artery ICA- internal carotid artery

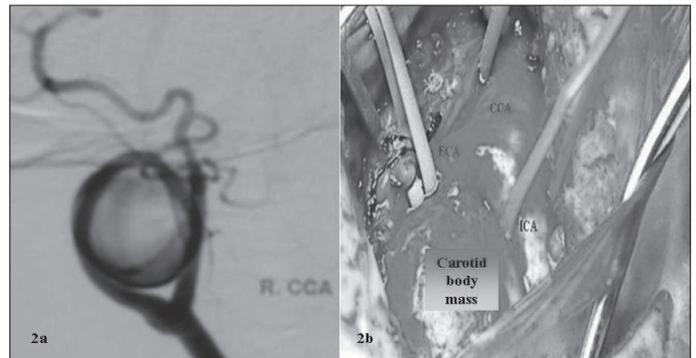


Figure 2. (a) A solid mass was visualized between internal and external carotid arteries in arteriography. (b) The surgical dissection of carotid mass, CCA, ECA and ICA

CCA - common carotid artery, ECA - external carotid artery ICA- internal carotid artery

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surgery. During intraluminal shunt, it was difficult to control the blood pressure despite adequate medical management. There were sudden drops of bispectral index monitoring values similar to the first case report during periods of hemodynamic changes. The blood pressure was better regulated in the rest of the surgery. Patient was extubated in four hours time without any complications. There was no episode of high blood pressure (>140/90 mmHg) during follow-up.

Discussion

Preoperative angiographic imaging techniques are important aids for preparation of surgical approach to vascular lesions (Fig. 1, 2a).

During surgery, in several occasions including the carotid cross clamping periods, arterial blood pressure changes may lead to cerebral ischemia. The systemic blood pressure should be increased to drive adequate flow via collaterals to the area of ischemia as a temporizing measure. The primary routes of collateral circulation are the Willisian channels (anterior communicating artery, posterior communicating artery, and the ophthalmic via the external carotid artery).

The bispectral index (BIS) (Aspect Medical Systems Inc., Newton, MA) is an EEG-derived variable that measures the hypnotic depth of anesthesia. Other monitors for cerebral function monitoring include EEG, somatosensory- and motor-evoked potentials, transcranial Doppler ultrasound (TCD) and Xe cerebral blood flow (CBF) monitoring. BIS monitoring is an easy, noninvasive method. The only handicap of this monitor is that it may not be totally useful in the detection of cerebral ischemia related to carotid cross clamping. Middle cerebral artery region blood distribution may not be detected by frontal electrodes if the ischemia is not wide enough to involve most of the hemisphere.

Carotid artery surgeries have various complications including; cranial nerve injuries, stroke, and altered carotid chemoreceptor function that may cause failure to increase ventilation in the presence of hypoxia. The superior laryngeal nerve is possibly the most frequently injured nerve. In our first case report, patient had Horner Syndrome prior to the surgery and a hoarseness was persistent after surgery. In the second case, secretion of catecholamines from chromaffin tissues was suspected as the recent onset, severe high blood pressure resolved after surgery.

The BIS monitor was not designed, nor has it been validated for detecting ischemic brain injury (5). There have been several case reports in the literature of use of bispectral index for detection of inadequate cerebral perfusion (6, 7). In a recent study by Bonhomme et al. (8), a decrease in the BIS values was significantly correlated to an increase in suppression ratio and a longer time between induction and carotid cross clamping.

In the review by Knight et al. (1) overall morbidity in surgical management of carotid body tumor is approximately 3.3%, and mortality is approximately 2.0%.

Conclusion

The carotid body tumor resection surgery requires adequate monitorization for cerebral ischemia and signs of hemodynamic and respiratory events. Intraoperative BIS monitoring may be helpful in patients with uncontrolled hypertension for detection of cerebral ischemia.

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