



Simultaneous Carotid Endarterectomy and Oncologic Resection in Patients with Head and Neck Cancer: A Case Study and Literature Review

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Case Summary

A 76 year-old man with base of tongue cancer and severe carotid stenosis underwent neck dissection and carotid endarterectomy simultaneously. He initially presented after noticing discomfort when his dentures would make contact with his teeth, ultimately causing him to have difficulty eating. Patient had a history notable for an extensive smoking history, although patient quit 4 years prior to initial presentation, he also had hypertension on 3 antihypertensive agents, atrial fibrillation on Coumadin, high cholesterol on Statin therapy, and peripheral vascular disease. CT neck was obtained after initial presentation and demonstrated a right inferolateral/floor of tongue mass concerning for malignancy; he also had secondary features suggestive of metastatic lymphadenopathy vs. second primary. Tongue biopsy was performed confirming a diagnosis of squamous cell cancer.

CT angiogram of neck performed in the interim which noted "critical stenosis" (>80%) of the proximal right internal carotid artery. The patient was seen by a vascular surgeon in consultation for asymptomatic, high grade carotid stenosis. He denies any prior history of TIA or stroke. After multidisciplinary discussion, it was decided that the patient should undergo simultaneous carotid endarterectomy, neck dissection, and reconstruction with staged oncologic resection of tongue mass. Extensive conversation was carried out with the patient in regards to stroke prevention versus 5 year survival from his head neck surgery. The senior head and neck surgeon felt that the patient had a better than 5 year survival and extensive conversation was carried out in regards to the need for postoperative radiation and with this created a problem for the endarterectomy.

Patient was taken to the OR for right submandibular triangle and gland resection, right modified neck dissection (levels I to IV), right carotid endarterectomy with ipsilateral greater saphenous vein patch, pectoralis major flap, and tracheostomy. This portion of the operation was technically a clean operation with a plan for staged floor of the mouth reconstruction in 2 weeks. The choice her greater saphenous vein patch was chosen to the possibility of future contamination. Total operative time was 3 h 20 min, total anesthetic time was 5 h 34 min. Neuromonitoring was performed during the entire procedure, with no adverse changes noted during the procedure.

Postoperatively, patient had normal neuro exam and showed no signs of stroke. Patient was started on vasopressors with SBP goal of 110 to 160 in attempt to prevent any hypotensive events and was transferred to Neurocritical Care Unit (NSICU) for close monitoring post procedure. Cardiology was consulted while patient was in the ICU for hypotension and had normal TTE. Patient was weaned off hemodynamic support on post-operative day 2 and transferred to step-down unit from NSICU on post-operative day 3. The remainder of the patient's hospital course was uneventful and he was discharged home on post-operative day 4.

Patient had carotid duplex done 2 weeks post procedure--prior to reconstruction of his mandible, which showed 0% to 19% stenosis on right and 20% to 39% stenosis on the left side with visualized plaque. At 2 week follow up, patient had no evidence of postoperative neurologic effects. It was recommended that patient remain on Statin therapy and aspirin. Patient was also recommended for repeat carotid duplex in 3 to 6 months.

Literature Review

A review of the English language literature was undertaken by searching PubMed, and Google Scholar using the key words: Combined carotid endarterectomy in radical neck dissection;

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combined carotid endarterectomy and modified radical neck dissection; concomitant neck dissection and carotid endarterectomy; carotid reconstruction at the time of radical neck dissection; to determine the indication for simultaneous carotid endarterectomy and oncologic resection and/or neck dissection. While, combined coronary artery bypass graft and carotid endarterectomy is well researched and a variety of indications exist. However, incidence of combined CEA and oncologic resection and neck dissection is not as common. Perioperative stroke risk, clinical significance and incidence of radiation induced carotid stenosis, and combined CEA and resection and neck dissection outcomes are of great importance when determining whether these patients should be screened preoperatively and if subsequent intervention should take place if patient is found to have clinically significant carotid stenosis.

Perioperative Stroke Risk

There is a wide range of reported risk for perioperative stroke following head and neck surgery, studies have shown risk as high as 4.8% and as low as 0.2% [1,2]. As a result of these studies, there is no consensus on whether preoperative screening and/or intervention is indicated. A case study of an 84 y/o F with maxillary gingival carcinoma after having left subtotal maxillectomy, neck dissection, and tracheotomy who was found to have evidence of cerebral ischemia in distribution of L MCA 6 h postoperatively. Patient's CT showed calcification in the carotid artery preoperatively, so patient remained on his Statin, but no intervention was recommended. Notably, this patient also had additional risk factors for stroke [3]. A large cohort study reported a 0.7% incidence of perioperative stroke in patients undergoing neck dissection. It also found that over time the incidence decreased, patients who had operation 2007 to 2012 had better outcomes than patients prior to this time period. It suggested that manipulation of the neck that occurs during neck dissection did not increase risk of perioperative stroke. It did note that general anesthesia was an independent predictor of perioperative stroke [4].

Radiation-Induced Stenosis

It is common for patients with head and neck cancer to receive radiation therapy in addition to surgical resection. Numerous studies have demonstrated the effect of radiation on the arterial system following targeted head and neck radiation therapy. Although the pathophysiology of radiation-induced carotid stenosis is not fully understood, what remains to be seen is that the effects of radiation therapy can produce clinically significant disease, thus increasing the risk of stroke. Radiation-induced stenosis appears to possess different characteristics than atherosclerotic disease. There are multiple theories that suggest the process by which radiation-induced stenosis occurs. These theories include dysfunction of endothelium, injury and occlusion of vasa vasorum, and accelerated atherosclerosis [5]. A study of head and neck cancer patient's s/p RT showed 18 patients with high-grade stenosis, 9 of which required surgical intervention with either CEA or carotid artery stenting [6]. In a separate study, an association was found between development of carotid stenosis and dose of radiation therapy, increase in interval after RT, and presence of hyperlipidemia [7].

Simultaneous CEA and Head and Neck Surgery

There is a paucity of data detailing combined carotid endarterectomy and oncologic resections of the head and neck. A study done in 1998 reviewed patients who underwent simultaneous CEA

and neck dissection. It found that there was no additional morbidity or mortality associated with combined surgery. However, it was unable to identify any absolute indication for combined surgery [8]. In a case study of a patient who had CEA and esophagectomy performed, patient did not sustain perioperative stroke [9]. Another study, done in 2013, identified 11 patients who underwent simultaneous CEA and oncologic resection, none of whom suffered perioperative stroke. There was a recommendation to obtain carotid imaging if patient was symptomatic or had carotid bruit, but did not advocate for routine screening of these patients [10]. Per Flor et al. [10], there may be a role for Multi-Detector Computed Tomography (MDCT) in identifying carotid stenosis in this patient population, study result showed MDCT to be reliable in detecting ICA atherosclerotic disease. In this study population, disease was found to be more prevalent in older patients; still it was still recommended that all patients have MDCT completed regardless of age [11].

The decision making in regards to this case was extremely challenging. The patient had a clinically asymptomatic carotid stenosis; and most notably head neck cancer which that would require a multi-staged operation, followed by post-op radiation therapy--with very little data on how the affects of postoperative radiation on the freshly endarterectomized carotid, this affects the post-CEA carotid artery. Still, he was a highly functional individual who was thought to have a greater than 5-year life expectancy after resection, reconstruction, and radiation therapy. As such, based on the asymptomatic carotid artery surgery trial data [12], we recommended carotid endarterectomy. In addition, his asymptomatic lesion was very heavily calcified making carotid stenting less attractive. Finally, since his oropharynx was going to be violated; we needed to use a patch with the best resistance to infection, leading us to choose autogenous vein.

After reviewing the literature, we would support that symptomatic patients, those with carotid bruit, or with multiple risk factors for carotid stenosis should undergo preoperative screening for carotid stenosis. Furthermore, we support that patients found to be symptomatic, or have asymptomatic high-grade stenosis; can based upon our experience; and a few other small series probably undergo simultaneous carotid endarterectomy along with oncologic resection and/or neck dissection. One could add that MRI brain should be considered for high grade, clinically asymptomatic carotid stenosis to determine if the patient was having silent neuro-ischemic events (we did not do this in this case). There is not enough evidence to support preoperative screening for all patients undergoing surgery for head and neck cancer. There are also no findings to suggest increased morbidity or mortality after undergoing combined surgery.

Conclusion

In the hands of a well skilled vascular surgery team with a very low perioperative stroke rate after carotid endarterectomy and a skilled otolaryngology team it is not unreasonable for patients to undergo simultaneous oncologic resection, neck dissection, and CEA for high-grade carotid stenosis.

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