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C. Soulier^a P. Dulguerov^a J. Maurice^b A.S. Allal^c B. Faidutti^b W. Lehmann^a

^a Department of Otolaryngology Head and Neck Surgery,

^b Clinic of Cardiovascular Surgery, Department of Surgery, and

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Carotid Artery Reconstruction following Resection during Radical Neck Dissection

Abstract

From 1972 to 1991, 7 patients with advanced cancer of the head and neck and nodal metastasis with capsular rupture underwent radical neck dissection and sacrifice of the carotid artery. Vascular reconstruction was performed with either an autologous venous (8 cases) or arterial (1 case) graft. In all patients, the postoperative course was uneventful without neurologic complications. One patient is alive 4 years after the procedure. Six patients expired after a mean survival of 20 months. The indications for vascular reconstruction are discussed.

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Introduction

The curative treatment of advanced carcinoma of the head and neck, associated with cervical node metastasis of >3 cm diameter or capsular rupture, usually involves a wide surgical resection of the primary tumor and a radical neck dissection followed by postoperative radiotherapy [1]. Sometimes the tumor invades the carotid artery and, in these cases, neck dissection should be associated with resection of the carotid artery. These vascular sacrifices can lead to serious neurologic complications due to cerebral ischemia [2]. We report our experience with 7 cases of carotid reconstruction, and analyze our results in light of the relevant literature.

Patients and Methods

Between 1972 and 1991, seven patients underwent a radical neck dissection with resection of the carotid artery and vascular reconstruction by a venous graft. Six patients had cervical lymph node metastases of a squamous cell carcinoma originating from the upper

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This article is also accessible online at: http://BioMedNet.com/karger aero-digestive tract, and 1 patient had cervical lymph node metastasis from an unknown primary. All patients were male, with an average age of 56 years (range 44–69 years).

Sacrifice of the internal carotid artery was performed in all cases because of its cancer involvement. In 4 patients, cervical recurrence was noted after full surgical and radiotherapeutic treatment. The delay between the recurrence and the original treatment was: 11 months after hemiglossectomy and homolateral radical neck dissection; 14 months after radical neck dissection and lingual radioactive implants; 15 months after total laryngectomy and selective bilateral neck dissection of nodal groups II-IV, and 34 months after partial glossectomy and homolateral supraomohyoid selective neck dissection in a patient who had undergone horizontal supraglottic laryngectomy and contralateral radical neck dissection 5 years previously. In 3 cases, the carotid artery was resected during the initial surgical treatment. Two of these presented with cervical metastases of >6 cm in diameter from an unknown primary in 1 case and in relation to a tonsillar squamous cell carcinoma in the other. The last patient presented a large piriform sinus carcinoma with significant neck extension infiltrating the carotid artery, without palpable lymphadenopathy. These last 3 patients underwent postoperative radiation therapy after vascular grafting.

Arteriography was performed preoperatively in all the cases in order to study the permeability of the circle of Willis. A graft using the greater saphenous vein was used four times, the cephalic vein in

Prof. Willy Lehmann Department of Otolaryngology Head and Neck Surgery, Geneva University Hospital 24, rue Micheli-du-Crest CH–1211 Geneva 14 (Switzerland) Tel. +41 (022) 372 8237, Fax +41 (022) 372 8240

^c Division of Radiation Oncology, Geneva University Hospital, Geneva, Switzerland

1 case, and the superficial femoral artery in another case. Harvesting of the graft was done by the cardiovascular surgeon simultaneous to the neck dissection, thereby decreasing the duration of the procedure. No specific postoperative testing of the patency of the graft was performed, except in the only long-term survivor in whom the presence of an obstructed flow was confirmed by a Doppler ultrasound.

Results

Morbidity

The postoperative course was uneventful and without complications in 6 cases. A patient developed a pulmonary embolism on the 7th postoperative day, which resolved well under anticoagulation treatment. No patient developed a neurologic complication.

Survival

One patient is alive 5 years after the operation. This patient presented a neck recurrence after 19 months, which was treated by surgery and radiation therapy, and has remained without recurrence for 29 months.

Six patients died, all of their disease. Three patients died with a cervical recurrence after 18, 19, and 26 months, respectively, of which 2 were homolateral to the vascular bypass. One patient developed a neck metastasis contralateral to the carotid bypass, and he expired 6 months after the initial operation. Finally, 2 patients died of distant metastases after 11 and 13 months.

Discussion

When bulky cervical metastases invading the carotid vessels are present, the prognosis is usually poor [3]. Possible therapeutic options include conservative nonoperative treatments or incomplete surgical resection seeking to preserve the involved vessels. Both of these treatments give extremely poor results and should probably be considered as palliation rather than effective curative treatment. More aggressive therapeutic options include resection of the involved vessels, with or without reconstruction using a bypass graft. If a bypass graft is not used, functional problems secondary to the sacrifice of the vessels supplying the brain are to be expected.

Since 1970, we have systematically reconstructed the resected neck vessels when technically feasible and when an extracranial carotid stump of sufficient length was available in order to allow anastomosis. In our 7 carotid resections, the postoperative morbidity was small with no neurological complications.

Our survival results are poor despite the large surgical resection. This is to be interpreted in the context of the poor prognosis of this type of disease. Indeed, 1 patient is alive, with a postoperative interval of 5 years. Among the 6 deceased patients, locoregional control was achieved in 2 cases, bringing the global locoregional control to 43% (3 of 7 cases). The average survival was 20 months.

Analysis of the literature reveals the difficulties of either carotid surgical resection alone or with vascular bypass grafts. Different techniques have been developed to predict the tolerance to interruption of the carotid arterial flux. The test of Mattas, described at the beginning of the century, examined the tolerance to manual compression of one or both carotid arteries. Certain authors performed staged carotid artery ligation in order to enable the development of a collateral vascular network [4]. Other tests involve recording of EEG or sensory somatic potentials to demonstrate cerebral ischemia [5]. Subsequent techniques used the measurement of stump pressures of the carotid artery by either ocular pneumoplethysmogram or by direct measurement with a catheter within the internal carotid artery.

If the results appear satisfactory to some authors [5–8] despite the small percentage of cerebral vascular accidents, others show the poor reliability of these tests to predict subsequent neurologic damage [9, 10]. The large variability in stump pressure measurements are underscored, making the determination of a threshold pressure, above which the stroke risk was absent, difficult. Also, these measurements are performed once and under optimal cardiovascular conditions, and therefore do not reflect the effects of variations in blood pressure levels.

Another relatively recent technique allows evaluation of the cerebral blood flow by computerized tomography with xenon. De Vries et al. [10] studied 136 patients using this method during temporary occlusion of the ipsilateral internal carotid artery. Twenty-one patients who responded favorably to this test underwent either resection or definitive closure of the internal carotid artery without complications.

When a favorable postoperative assessment enables a simple carotid resection, the possibility of a secondary thrombosis of the carotid stump is a situation which could lead to cerebral embolism [5, 8, 11]. On the other hand because of tumoral invasion, Brennan and Jafek [12] performed 7 carotid resections based on the results of tolerance tests. There were 2 strokes, and the authors underlined the bad oncologic prognosis, since all these patients died within 1 year.

Carotid Artery Reconstruction

In light of these different elements, vascular reconstruction seems desirable. Analysis of the literature shows that even if the results are generally satisfactory, such a reconstruction will not prevent complications in every case. Since 1980, we found 9 studies with a total of 80 cases [13-21]. Fifty-five patients were free of complications (69%). Twelve patients suffered a cerebrovascular accident, resulting in death in 2 cases. Five patients hemorrhaged from an anastomotic rupture resulting in 2 deaths and 1 patient with neurologic sequels. One patient developed a graft thrombosis and underwent three unsuccessful reoperations without any neurological compromise. One patient developed a transient ischemic attack 2 weeks postoperatively. Six patients died from causes not related to the graft. The risk of graft thrombosis or anastomotic rupture does exist, and can result in serious complications. This was also emphasized by Snyderman and D'Amico [22], who demonstrated a neurological complication rate of 17% during carotid resection, without a significant difference between those patients having undergone simple ligation and those with vascular reconstruction.

Currently, in light of the progress in medical imaging, our preoperative assessment in suspected carotid tumor invasion would include a CAT scan and either an ultrasound of the cervical carotid artery or an MRI to evaluate the parapharyngeal space. In case of confirmed invasion, an arteriogram with a carotid occlusion test would be indicated. Despite the poor oncologic results, we think that carotid artery sacrifice and reconstruction by a venous bypass appear justified because of our excellent functional results and the lack of postoperative neurologic complications. Nevertheless, regarding bypass grafts, a certain number of complications are found in the literature. Until new tests are available to identify patients that do not require vascular reconstruction, we maintain the indication of carotid bypass in certain, hopefully rare situations.

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