Extracranial-intracranial (EC-IC) bypass for carotid complications in irradiated head and neck cancer patients

Chin-Nung Liu[1], Tzu-Hua Chen[2], Yi-Tsen Lin[1], Kuo-Chuan Wang[2]

1 Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan
2 Division of Neurosurgery, Department of Surgery, National Taiwan University Hospital, Taipei, Taiwan

Introduction

Carotid complications represent a serious sequela in patients with previously irradiated head and neck cancers. Carotid blowout, often secondary to pseudoaneurysm formation, can be fatal, whereas carotid occlusion may result in stroke-like symptoms. Extracranial–intracranial (EC–IC) bypass offers a means of maintaining adequate cerebral perfusion in this high-risk population. We present a case series of patients with prior head and neck cancer treatment who developed carotid complications and subsequently underwent EC–IC bypass, with emphasis on preoperative considerations and surgical planning.

Methods and Materials

We retrospectively reviewed patients who underwent EC–IC bypass between 2014 and 2025. Clinical data including cancer type and stage, presenting symptoms, graft type, and recipient vessels were analyzed. The surgical procedure involved harvesting either a saphenous vein or radial artery graft, temporary occlusion of the donor and recipient vessels (target: M2 segment of the middle cerebral artery), microsurgical anastomosis, and subsequent embolization of the diseased carotid artery.

Results

Eleven patients underwent EC–IC bypass, including 4 bilateral cases. The mean age at surgery was 49.1 ± 10.4 years (median 50.2). All were male, with 4 (36%) having received re-irradiation. The interval between radiotherapy and bypass surgery was 11.5 ± 8.9 years (median 10, range 1–32 years). Ten patients had a history of nasopharyngeal carcinoma and one had oropharyngeal carcinoma. Grafts included 6 saphenous vein and 9 radial artery conduits. Two perioperative complications were recorded: one postoperative hemorrhage attributed to hyperperfusion and one intracranial abscess. Summary of patient information is presented in Table 1. A schematic of the preoperative evaluation process is presented in Figure 1 and 2.

Conclusions

In this series, re-irradiation for nasopharyngeal carcinoma appeared to be a potential risk factor for carotid complications necessitating EC–IC bypass. While most patients developed complications more than a decade after radiotherapy, earlier onset within two years was also observed. Graft selection remains a critical factor in surgical planning. Overall, EC–IC bypass is a feasible and safe option that can preserve cerebral perfusion and improve quality of life in this complex patient population.

***Table 1*. Basic demographic of case series**

Characteristics	Total cohort (11 patients, 15 procedures)
Age, years	49.1 ± 10.4
Male sex, n (%)	4 (36.3%)
Cancer type, n (%)	
Nasopharyngeal carcinoma	10 (90.9%)
Oropharyngeal cancer	1 (9.1%)
Radiation courses, n (%)	
Once	7 (63.6%)
Twice	4 (36.3%)
Time after radiation therapy, years	11.5 ± 8.9
Carotid complication, n (%)	
Threatened blowout	4 (36.4%)
Impending blowout	4 (36.4%)
Carotid occlusion	3 (27.2%)
Bilateral EC-IC bypass, n (%)	4 (36.3%)
Graft selection, n (%)	
Radial artery	9 (60%)
Saphenous vein	6 (40%)
Donor vessel, n (%)	
Common carotid artery	3(20%)
Subclavian artery	3(20%)
Superficial temporal artery	4(26.7%)
Superior thyroid artery	4(26.7%)
External carotid artery	1(6.7%)

***Figure 1.* Clinical management pathway for post irradiation carotid complications excluding active carotid blowout.**

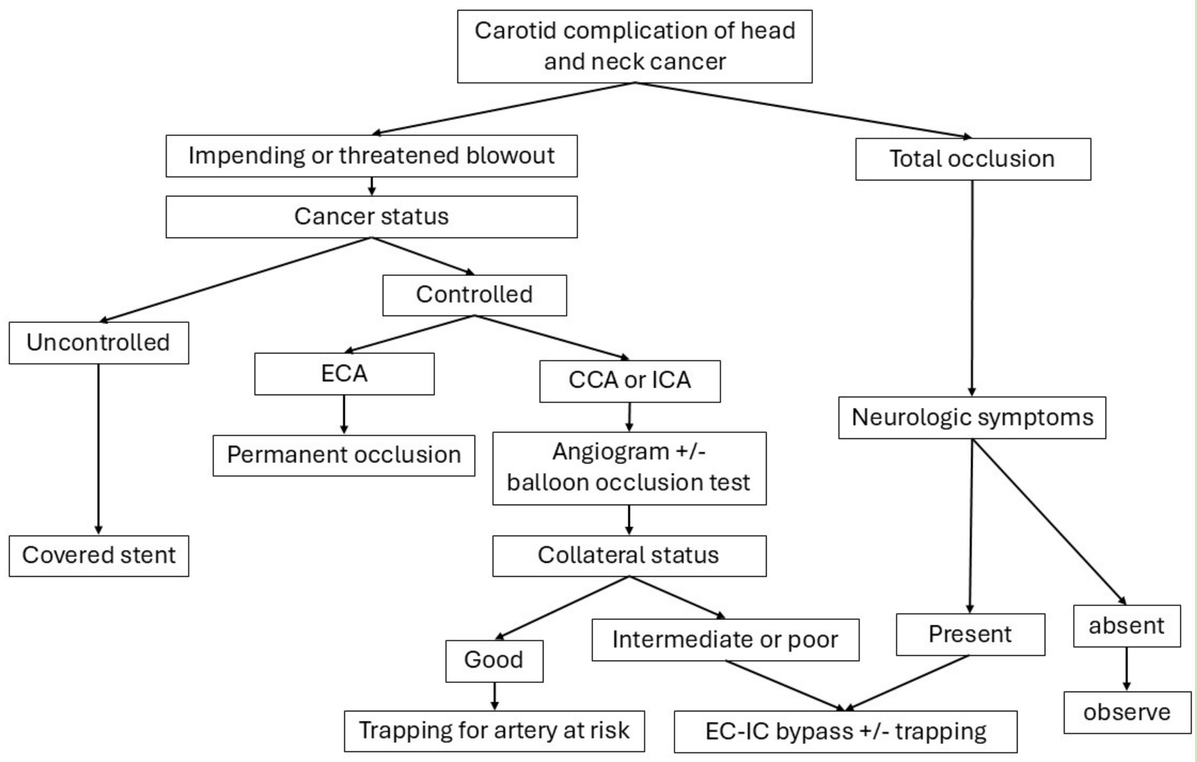
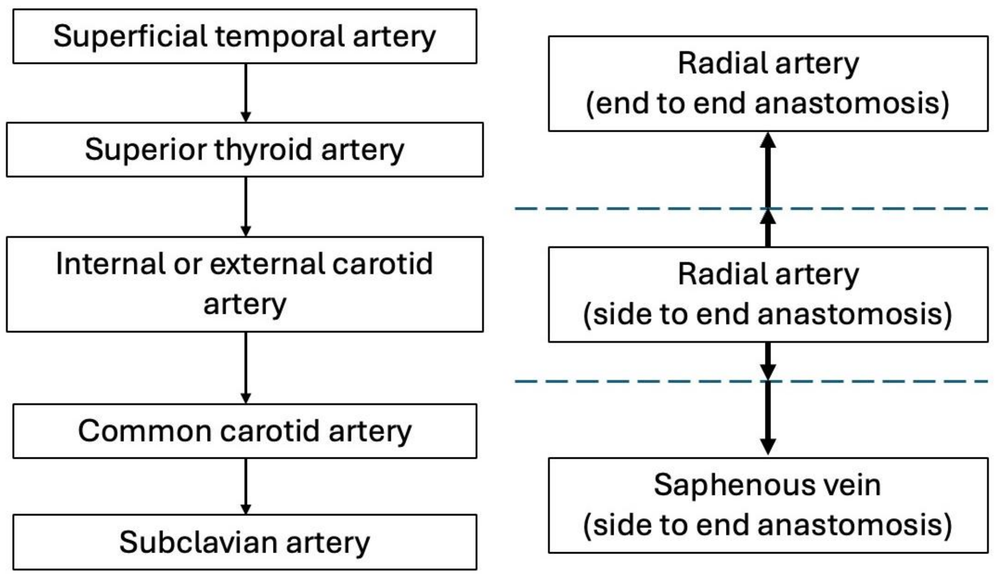


Figure 2.Algorithm of vessel graft selection



Corresponding Author

Chin-Nung Liu, MD
Department of Otolaryngology, National Taiwan University Hospital,
#7, Chung-Shan South Road, Taipei, Taiwan
E-mail: baron831120@gmail.com