Safety and Efficacy of Carotid Artery Balloon Test Occlusion in Head and Neck Cancer Patients

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BACKGROUND

- Advanced head and neck cancers can invade the carotid artery and lead to life-threatening complications, such as carotid blowout syndrome (CBS).
- Balloon test occlusion (BTO) can be useful in determining the ischemic risk of carotid sacrifice by assessing the neurological exam during temporary hemostasis and evaluating collateral circulation across the circle of Willis.

OBJECTIVES

- Here, we aim to review the literature on the safety of carotid artery BTO and the methods utilized to improve its predictive value in head and neck cancer patients.

METHODS

Following PRISMA guidelines, we conducted an electronic database search. We screened 404 studies with two independent reviewers utilizing Covidence and included 20 studies (827 patients) from 1992-2022.

Inclusion Criteria: Studies assessing safety and efficacy measures for carotid BTO in head and neck cancer patients of all ages

Exclusion Criteria:
- Therapeutic balloon occlusion rather than diagnostic balloon occlusion
- Did not address efficacy and safety
- Did not involve the carotid arteries
- Alternative occlusion test
- Not focused on head and neck cancer.
- Literature reviews and meta-analyses

RESULTS

Imaging Modality	Number of Studies	Number of Patients
Angiography	10	602
SPECT Brain Analysis	9	208
CT Perfusion	1	41
MRI	1	12
Neurophysiological Monitoring	1	13
NIRS (rSO_2 Monitoring)	1	10

Table 1. Imaging modalities utilized during BTO.

Complication	Number of Studies	Number of Patients	Key Details
No complications	10	855	No hemorrhage or stroke
Transient neurological deficits	6	10	Hemiplegia, unconsciousness, transient monocular blindness, facial nerve palsies
Thromboembolic event	3	19	Stroke, TIA
Long-term neurological deficits	1	1	Visual deficit

Table 2. Complications associated with BTO.

Measure	Predictive Insight
Venous phase delay	< 3 sec → predictive of safe occlusion
CT Perfusion	Correlates with collateral flow & stump pressure; may predict delayed stroke
HMPAO SPECT	Commonly utilized for *acute* outcome prediction Poor cross filling in anterior circulation = risk indicator
Cerebral blood volume mapping / parametric color coding	New and useful during BTO

Table 3. Measures utilized alongside BTO and their predictive insights.

TECHNIQUE

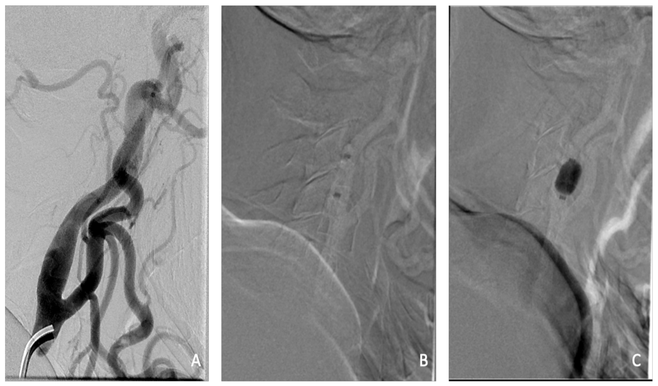

Figure 1. BTO demonstrated on Angiography. Digitally subtracted lateral right common carotid arteriogram (A) shows normal appearance of the carotid bifurcation and cervical ICA. Roadmap right common arteriograms show 8 French Walrus balloon guide catheter radiopaque markers (B) and contrast-filled balloon (C) to achieve flow arrest.

CONCLUSIONS

- Overall, BTO is a safe and effective method for assessing viability of carotid sacrifice in head and neck cancer patients, with majority of literature showing no complications from this intervention.
- There are a variety of imaging modalities and predictive measures that can be utilized alongside BTO to evaluate high-risk patients, with angiography being the most common.
- Thus, BTO can be a useful tool in guiding diagnostic work-up before endovascular or surgical interventions for acute CBS to optimize patient outcomes.

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