

# External Carotid Artery Embolization

## Introduction

Embolization of lesions fed by branches of the external carotid artery (ECA) has become a common and accepted practice to provide primary or adjunctive therapy of lesions fed by this arterial territory. Primary therapy is intended to effect a resolution of the problem via ECA embolization alone. Adjunctive therapy is usually performed before surgery to reduce blood loss, facilitate lesion removal, and reduce surgical risk (1).

The following guidelines are intended for use in quality improvement programs to evaluate ECA embolizations. Assessment guidelines include indications for embolization, success rates for achieving embolization goals, and complication rates.

## Discussion

ECA embolization may be defined as endovascular occlusion of branches of the ECA in an attempt to terminate or reduce blood flow to a lesion in the head, neck, or skull base region. The procedure is usually performed in conjunction with diagnostic angiography and most often is completed in one session.

The embolic materials most commonly used in this arterial distribution are particulate materials (ie, polyvinyl alcohol sponge particles; Gelfoam sponge or powder; Avitene; Embospheres; pushable, fibred or nonfibred coils; electronically detachable, mechanically detachable, or injectable coils) (2, 3). Liquid agents include acrylic adhesives and sclerosants such as absolute alcohol and hypertonic glucose. The choice of the embolic agent is made on the basis of the intended goal of embolization (preoperative versus primary therapy), the inclusion of normal tissue in the embolic field, and the level of performance necessary. All liquid agents and small particles (smaller than approximately 200  $\mu$ ) penetrate deeply into small normal vessels and may create severe ischemia, resulting in undesirable side effects such as skin necrosis and cranial nerve palsy. These unfavorable effects may be reduced by careful evaluation of superselective angiograms and provocative pharmacologic testing before embolization (4).

## Indications

The common indications for ECA embolization are the primary treatment of a disease process affecting the vascular territory of the ECA (eg, epistaxis, arteriovenous fistula [AVF]) or the adjunctive

reduction of blood flow to a lesion preoperatively. Preoperative embolizations may be indicated to control surgically inaccessible arterial feeders, reduce surgical blood loss, shorten the surgical procedure time, and increase the probability of total lesion resection. ECA embolization is typically considered appropriate in cases of hypervascular tumors, hemorrhage, and vascular malformations.

Hypervascular tumors (5–16) include juvenile nasopharyngeal angiofibromas, paragangliomas, meningiomas, neurogenic tumors, benign or metastatic bone tumors, and hemangiomas. Control of hemorrhage is sometimes needed in association with epistaxis (idiopathic or traumatic) (17–20), penetrating trauma, exsanguination from tumor, and postoperative complications (eg, pseudoaneurysms). Vascular malformations (21–25) include AVMs, fistulae, and dural AVF.

*Threshold:* 100%. When ECA embolization is performed for lesions without an established indication, a review should be conducted.

## Efficacy

The indications of efficacy are technical and clinical success. Technical success is defined as occlusion of the targeted vessels. Clinical success may include improvement or alleviation of symptoms associated with the lesion or appropriate preparation of a lesion for surgical resection.

Indicator	Threshold (%)
Technical	
Failure to occlude targeted vessels	>10
Clinical	
Palliation of targeted symptoms	<80
Reduction of operative blood loss	<80

## Safety

Undesirable outcomes or effects are known to occur in association with embolization. These include clinical and technical complications, and each can be categorized as severe or minor and as permanent or transient.

*Threshold:* When complication thresholds are exceeded, a review should be conducted.

Indicator	Threshold (%)
Nerve palsy (unintentional and nerve not targeted for resection)	
Transient	>2
Permanent	>1
Neurologic deficit	
Major permanent	>1
Minor permanent	>2
Transient	>3
Death	0

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