How to prevent complications of carotid body tumour resection

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The problem:

- In a metaanalysis of 67 articles that included 2,175 surgically treated patients:

New cranial nerves permanent deficits 483 **(22.2%)**

60 patients had permanent stroke **(3%)**

26 patients died due to postop complications **(1.3%)**

Suarez et al; Eur Arch Otorhinolaryngol 2014

Reduction of complications

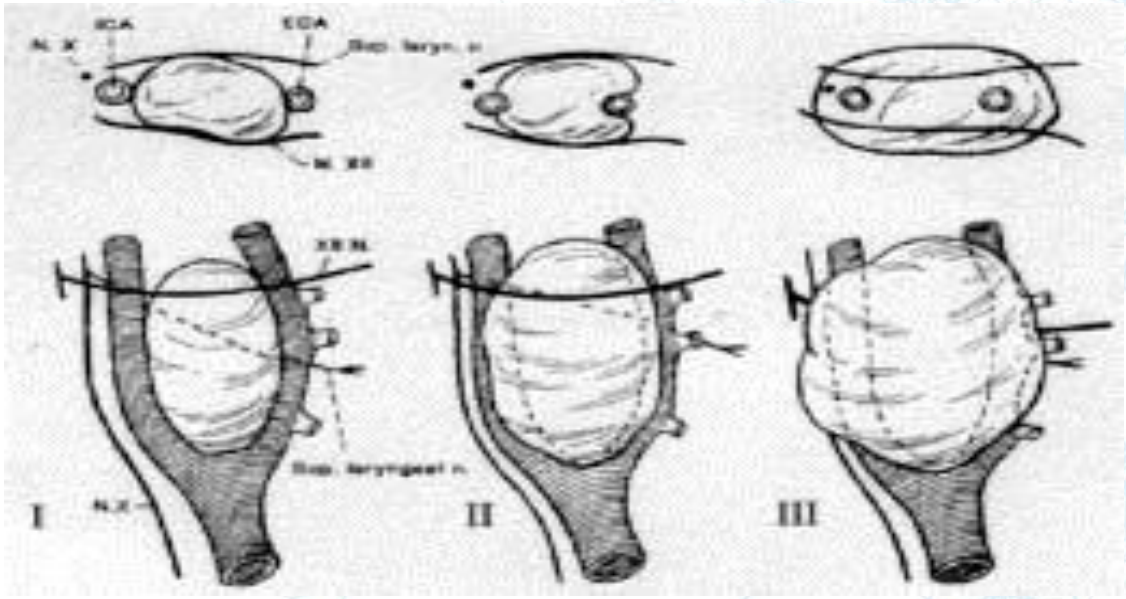
- Careful preoperative planning
- Cross sectional imaging
- Selective preopertive embolisation?
- Craniocaudal carotid tumor resection?
- Carotid artery reconstruction with selective shunting when necessary
- Radiotherapy

CT and MRI

- Axial imaging (CT and MRI) is important to measure the degree of circumferential involvement (Shamblin class) of the carotid artery by the CBT.

- This is useful to the surgeon who could predict complications, improve preoperative planning and patient counselling

Shamblin Classification Of Carotid Body Tumour

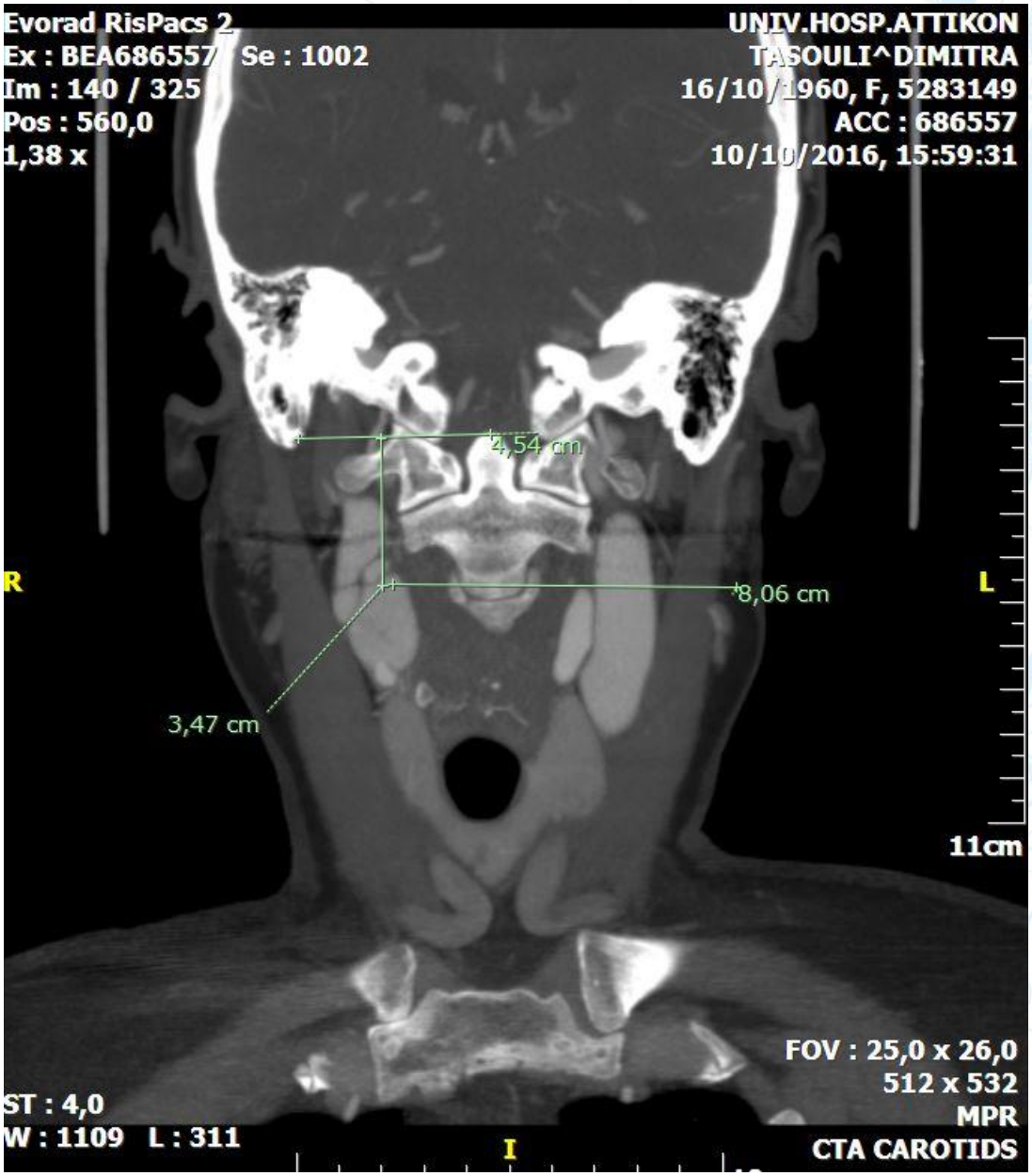


LOCALISED ADHERANT ENCASING

Shamblin WR, ReMine WH, SHeps SG, Harrison EG Jr. Carotid body tumour (chemodectoma): clinicopathologic analysis of ninety cases. Am J Surg. 1971 Dec; 122(6):732-9

- In a study that looked at imaging features associated with surgical complications following CBT resection (n=20), it was shown that a distance <2cm from the tip of the C2 dens to the superior aspect of the CBT is associated with increased incidence of perioperative cranial nerve injury.

Straughan et al; World J Surg 2015



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Craniocaudal CBT resection. Should it be the preferred surgical approach?

- The craniocaudal approach has the advantage of identifying the adjacent nerves of the CBT's cranial side at an early stage.

- Thus it may prevent accidental damage in case of haemorrhage later on during the operation.

Paridaans et al , Eur J Vasc Endovasc Surg 2013

- 45 consecutive CBTs were removed between 2006-2011 with the craniocaudal approach in 41 patients (7 Shamblin 1, 22 Shamblin II , 16 Shamblin 3).

- There were no cases of permanent cranial nerve injury or stroke

Paridaans et al , Eur J Vasc Endovasc Surg 2013

Risk of stroke

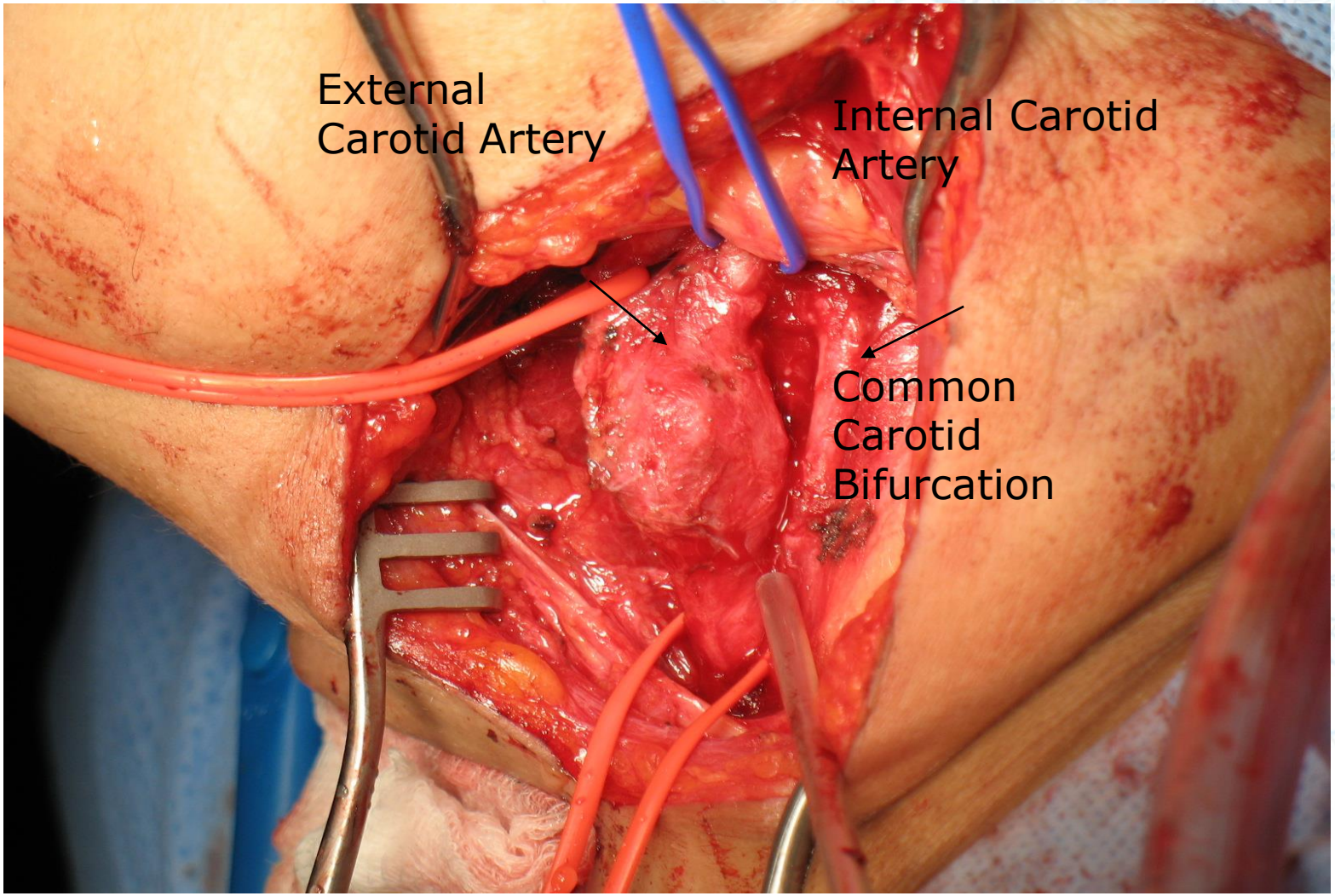
- In a meta-analysis of 67 articles that included 2,175 CBT resections, reconstruction of the carotid artery had greater mortality (1,61 vs 0.59%) and stroke (17.7 vs 3.5%)[1].

- To minimise stroke risk neuromonitoring, anticoagulation and selective shunting should be used for Shamblin 3 CBTs[2].

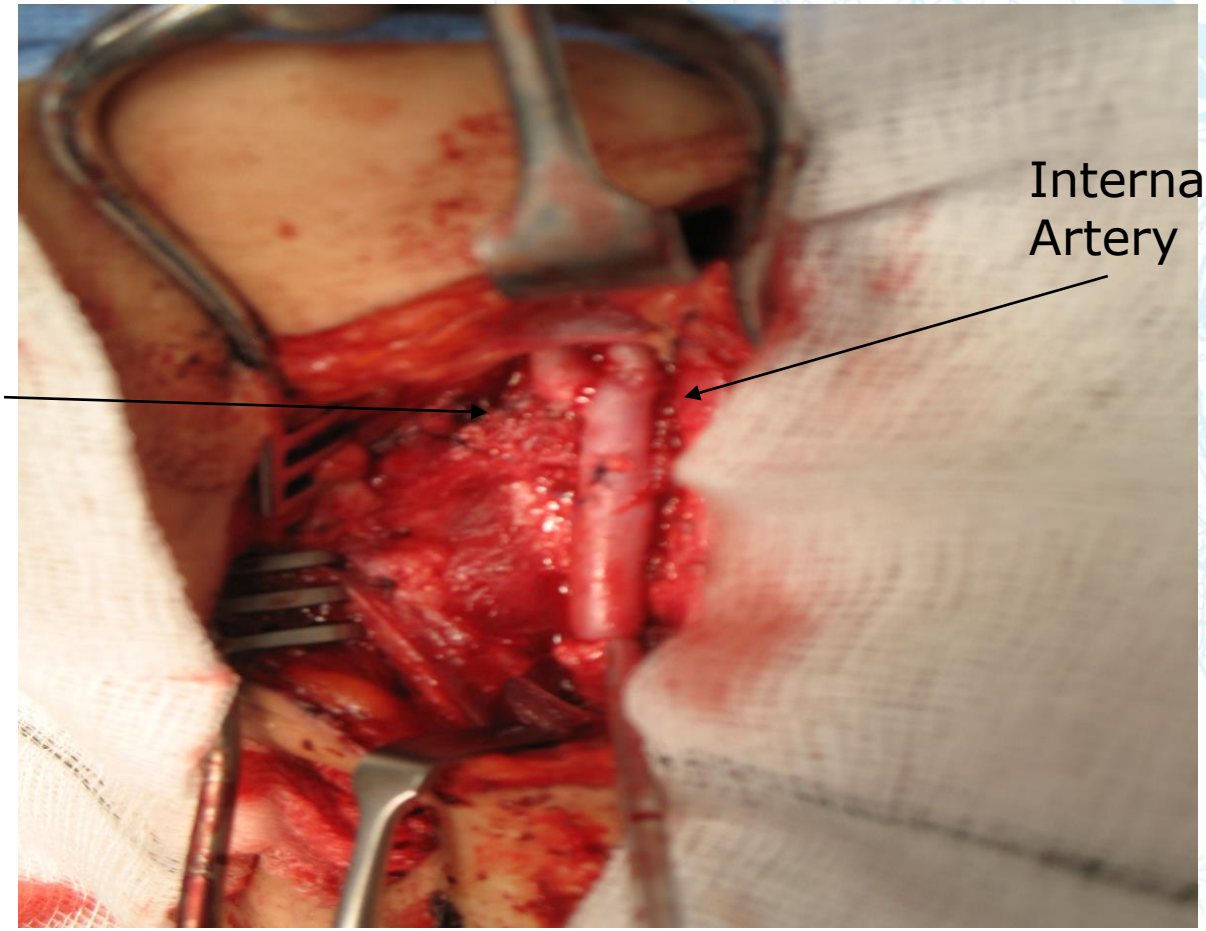
1 Suarez et al, Eur Arch Otorinolaryncol 2014

2 Kakkos et al, J Vasc Surg 2009

Intraoperative photos – Carotid Body Tumour



Intraoperative photos – Carotid Bifurcation reconstructed using reversed Saphenous vein graft



MRI Post Operative

Preoperative Embolization

Attractive Option Prior to Surgery to Reduce Bleeding and Tumor Bulk.

Disadvantages

- Associated with an inflammatory response that makes precise periadventitial dissection more difficult

  (Netterville et al Laryngoscope 1995;105(2):115-26)

- Risk of intracranial embolization

  Makeieff et al, Annals of Surgical Oncology 2008 ;15(8):2180-2186

- Can be quite tedious and hazardous.

Pre-op embolisation

- A retrospective analysis of the Nationwide inpatient sample (2002-2006;2117 patients) showed that carotid resection combined with embolisation (n=129) had a rate of postoperative haemorrhage or wound haematoma similar to the excision alone group (n=1686).

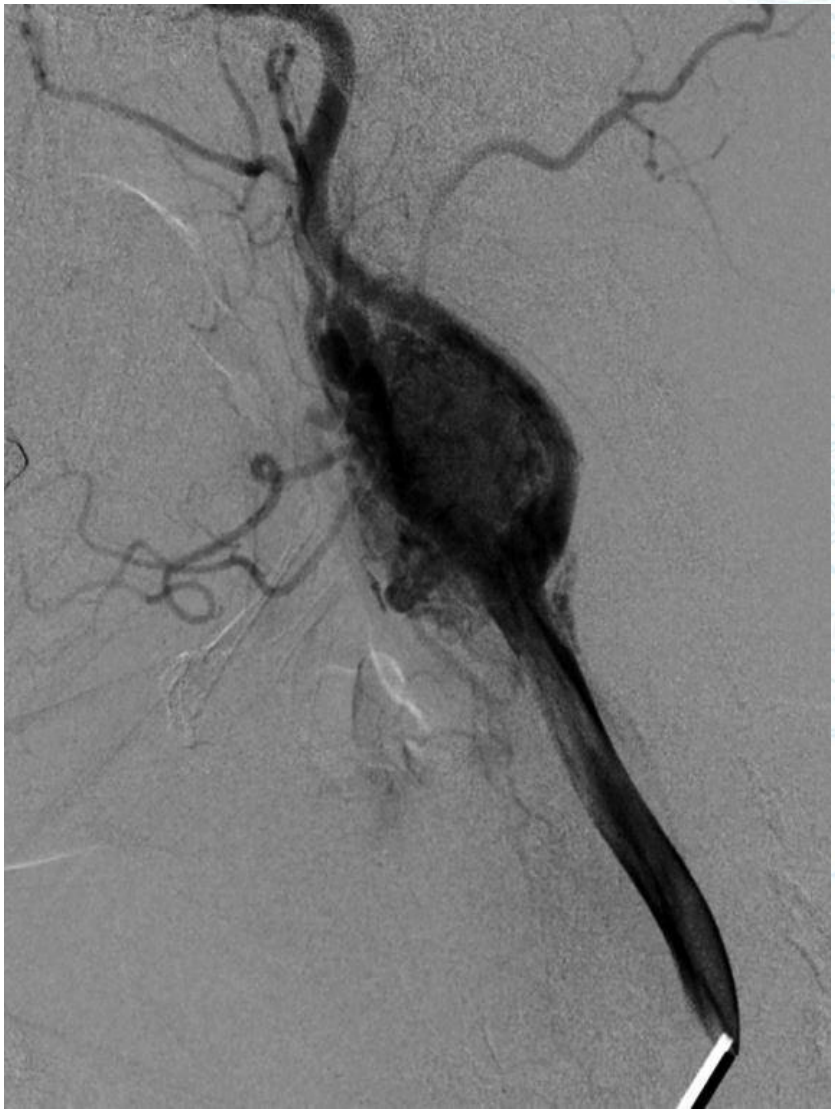
Vogel et al; Vasc Endovasc Surg 2009

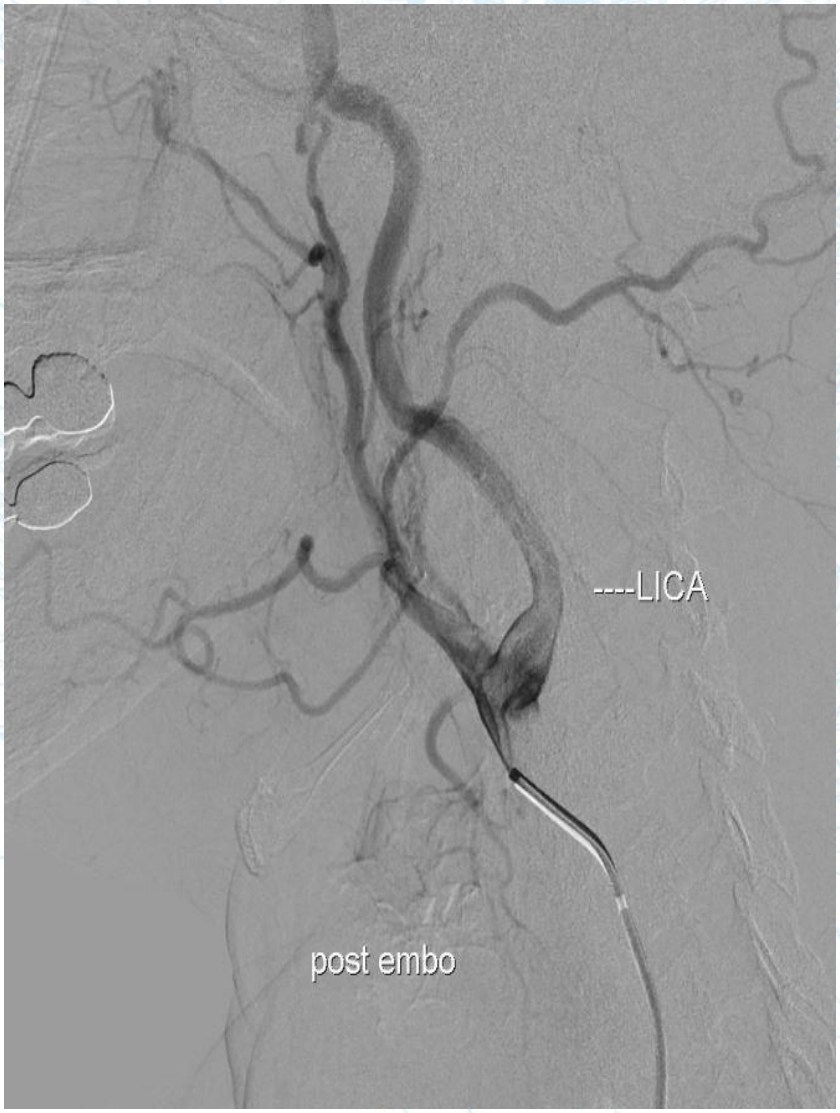
Preoperative Embolization

Currently, recommended only for:

- Tumors that are large (5cm in size)
- Shamblin's class III
- Extend significantly cranially

Kakkos et al, J Vasc Surg 2009;49:1365-73

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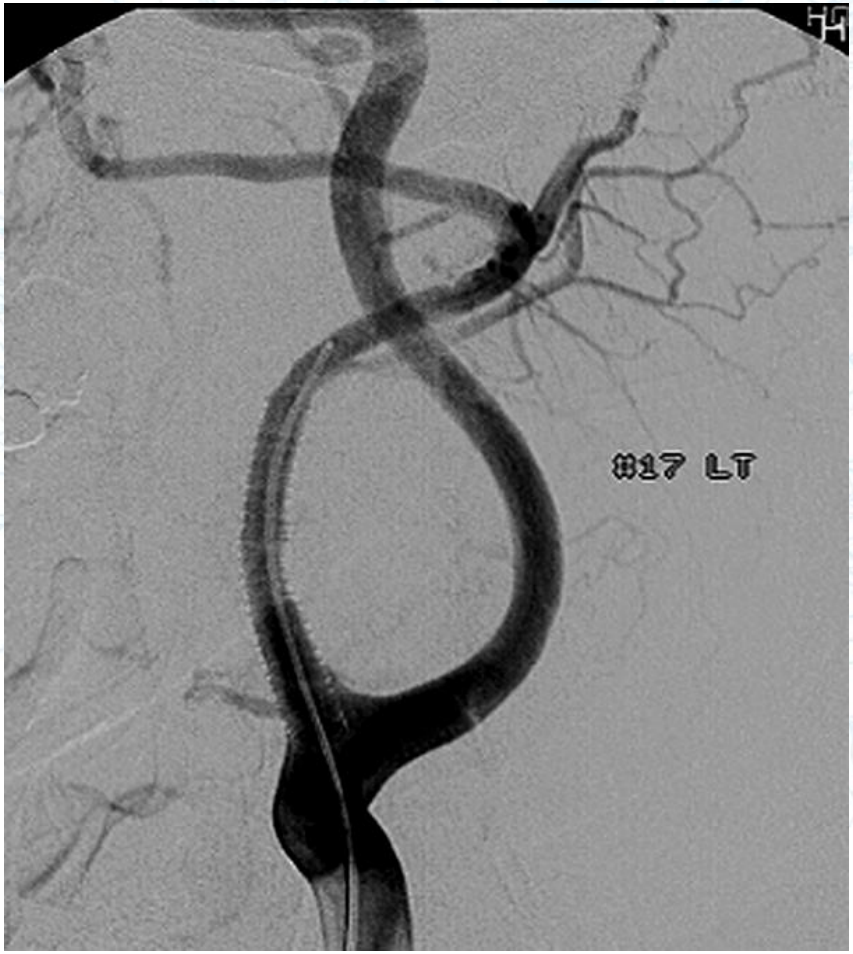
post embo

Covered Stent Placement of ECA

Scanlon et al, J Vasc Surg 2008;48:1322-4



A meta-analysis was performed of 60 studies reporting adjuvant endovascular interventions in the surgical management of CBT (n=526).

Economopoulos et al, J Vasc Surg 2015

Regarding permanent cranial nerve (CN) damage, the information provided did not discriminate between subgroups of those undergoing preoperative embolisation and open surgery and those undergoing open surgery alone, **thus it is impossible to determine the efficacy of embolisation on the prevention of CN function.**

Economopoulos et al; J Vasc Surg 2015;61:1081-91.

Radiotherapy for CBTs

- CBTs are radiosensitive.
- The definition of cure after radiotherapy is absence from further tumour progression.

Radiation may be considered for:

1. unrespectable tumours
2. In patients with contralateral CN injuries
3. patients with recurrent CBTs
4. patients with short life expectancy

Gilbo et al, Cancer 2014;120,3738-43

Conclusions

- CBT resection is still associated with significant morbidity
- Axial preoperative imaging is important for planning the procedure and counselling the patient.
- The evidence for risk reduction interventions is rather circumstantial.
- Radiotherapy appears to be an effective bail out solution for selected high risk patients.

Thank you for your attention!!!

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