

## Carotid space abnormalities

Tumour cause displacement of structures of

ICA	ECA	IJV	Tumour
Splayed posteriorly	Splayed away from ICA	Not relevant	Carotid body tumour
Anteriorly and medially		<i>Posteriorly and laterally</i>	Vagus Schwannoma (but at infrahyoid location- the IJV is not displaced too much posteriorly but mainly laterally- hence becomes difficult to differentiate from sympathetic nerve system Schwannoma (see below). But in general Vagus nerve Schwannoma will not show much enhancement. D/D of Vagus nerve Schwannoma will be cervical nerve root Schwannoma- they will also displace both carotid arteries anteriorly and IJV laterally.
Anteriorly	Anteriorly	<i>Anteriorly</i>	Sympathetic nerve system Schwannomas
Encased	Encased	Encased	Parapharyngeal mucosal squamous cell carcinoma and rarely (Shamblin type C) Paragangliomas
Posteriorly	Posteriorly	Posteriorly	Ansa Cervicalis Schwannoma (tend to be infra hyoid)

Summary :

1. All three displaced anteriorly- SNS Schwannoma
2. All three displaced posteriorly- Ansa Cervicalis Schwannoma
3. Arteries displaced anteriorly while Jugular vein displaced posteriorly and laterally- Vagus nerve Schwannoma (and cervical nerve root Schwannoma).
4. Arteries splayed with posterior displacement of ICA- CBT.

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Neurogenic tumour are -:

- Schwannoma – two types – Antoni A and Antoni B. Have low vascularity.
- Neurofibroma- Tend to have areas with target signs- dark centre and bright periphery (in MRI)

Extracranial Meningiomas:- 2% of all Meningiomas . Most common location are Sinonasal > middle ear > Temporal bone > PPA > infratemporal. Generally associated with NF2

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Shamblin Grouping/ classification for grading carotid body tumours -:

# Shamblin Grouping and Px, Tx

- Group 1: tumors were minimally attached to the vessels -- easily resectable
  - < 180 degrees circumferential involvement
- Group 2: tumors partially surround the vessel and were more adherent to vessel adventitia -- difficult to dissect but amenable to careful resection
  - 180-270 degrees involved
- Group 3: tumors adherent to the entire circumference of the carotid bifurcation -- surgical dissection was impossible, required sacrifice of the ICA with vessel replacement (need > 2 cm distal segment below skull base)
  - > 270 degrees involved\*\*
  - \*\* See Yousem et al re malignancy

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## Vascular salvageability -:

### 270-degree rule-

In general malignant tumours which encase a vessel by more than 270 degree, ----- are most likely infiltrating that vessel and it will be unlikely to salvage such a vessel during surgery. In case of Carotid artery this usually means in operability of tumour. In such case, the surgeon has two option-:

Option 1-: Choose radiotherapy or chemotherapy.

Option 2-: Preoperative balloon occlusion challenge- occlude the involved carotid artery preoperatively for some time and see how patient responds. If there is enough collateral flow, then surgeon can proceed to surgery.

## Shamblin grouping

Tumour which have  $\geq 270$  degree encasement of Carotid artery and still the artery may be salvageable is true with – Chordoma / adenocarcinoma and meningioma but never with SqCCa.

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Beware of glottic and supraglottic carcinoma which sometime spread from posterior aspect with very little laryngeal component and then can invade Carotid sheath and neck structures.

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## Nodal staging :

Central v/s lateral and Vertical demarcations (Above Hyoid, v/s below Hyoid) See diagram below -:

### 1. Central -:

#### a. IA and IB -:

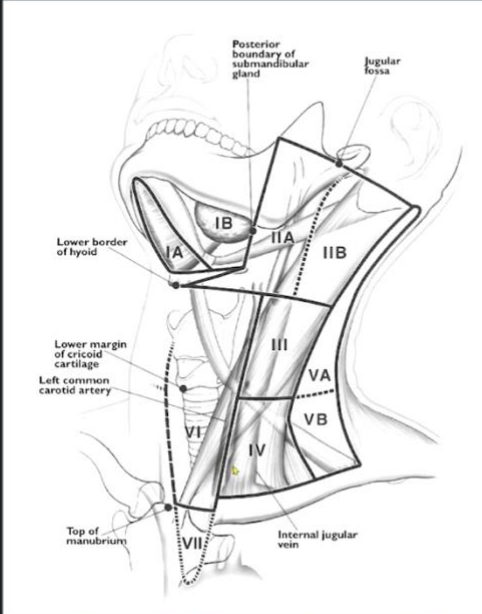
- i. IA- submental- mylohyoid
- ii. IB- Submental – digastric respectively)

- b. VI-: Below Hyoid but above Manubrium – paratracheal.
- c. VII- below Manubrium- paratracheal.

**2. Lateral nodes-:**

- a. II-Above Hyoid-
  - i. IIA- Entirely anterior to IJV
  - ii. IIB-; entirely behind the IJV
- b. III-: below Hyoid but above Cricoid
- c. IV- Between Cricoid and Clavicle
- d. V-: Entirely behind the sternocleidomastoid -:
  - i. VA-: Above cricoid
  - ii. VB- Below Cricoid.

## Lymph nodes by level of involvement



**IA: Submental**

**IB: Submandibular**

**IIA: UJ, ant to/abutting IJ**

**IIB: UJ. post to IJ**

**III: MJ**

**IV: LJ**

**VA: above cricoid**

**VB: below cricoid**

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**Som, P. M. et al. Am. J. Roentgenol. 2000;174:837-844**

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**Rare and unusual diagnosis in carotid space;  
(VITAMIN C & D)**

- Normal variant- medial deviation of the carotid artery due to weakness of the fascia.
- Mafan's syndrome
- Loeys Deitz syndrome : Aortic aneurysm (same as Marfans) + hypertelorism + bifid uvula and palate
- Infection: Lemeirs disease (thrombophlebitis of Jugular vein)
- Inflammation of floor of mouth >> extending to submandibular space >> and then to carotid space : Ludwig Angina (may lead to compromise of airway).

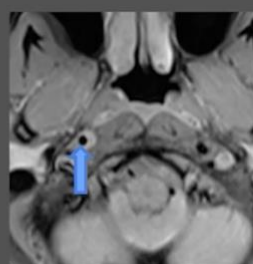
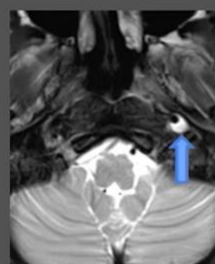
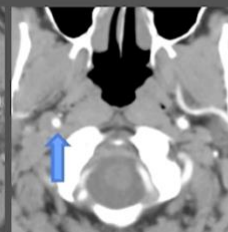
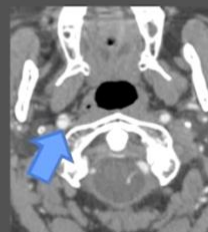
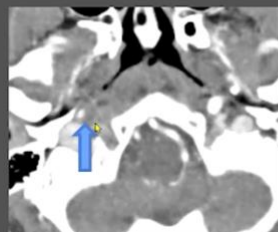
- Dissection of carotid artery -: Biffls classification of severity of traumatic injury of blood vessels.
- Biffl scale/ classifications for traumatic dissection of the blood vessels:

## Biffl Scale for Blunt CV Injury

- Grade I, irregularity or dissection with <25% stenosis
- Grade II, dissection with >25% luminal narrowing or a raised intimal flap
- Grade III, pseudoaneurysm
- Grade IV, complete occlusion
- Grade V, ICA transection, active contrast extravasation

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## Collage of ICA / CCA Dissection



Of the 370 patients identified with carotid and vertebral artery dissections, 30.3% developed 1 or more pseudoaneurysms: 39% of patients with carotid artery dissection and in 23% of patients with vertebral artery dissection  
JNS 2016 Daou B et al

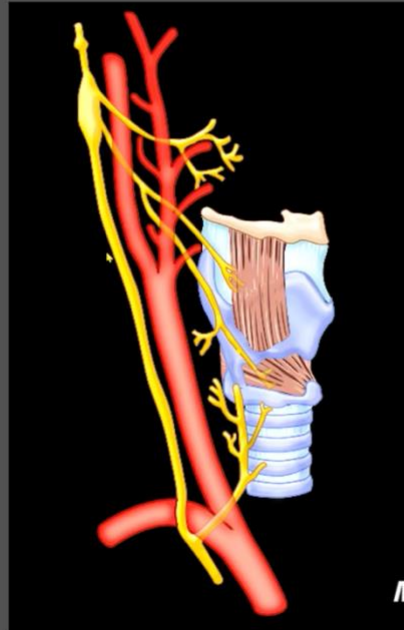
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- Carotid webs- are normal variant- but recently it has been shown that they do increase risk of recurrent stroke in the patient with web and first episode of stroke.
- Dissection – can be asymptomatic- the risk of stroke falls to baseline after 1<sup>st</sup> 2 weeks. So dissection with no symptoms are treated conservatively with antiplatelet drugs for 2 weeks and then the drugs are weaned off. MC dissection in neck is that of vertebral arteries.
- Carotidynia- thickening of wall and narrowing of vessel with inflammatory tissue around the Carotid artery- resolved in 2 weeks after NSAID treatment.

- Benign tumours of carotid space : Most tumour of carotid space are benign-: PGN (Glomus Jugulari , glomus vagal, CBT , Glomus Tympanicum) that GJ growing into middle ear) / Schwannoma / meningioma/ malignancy – 270 degree rule.

## Vagus Nerve Anatomy

### Vagus Nerve



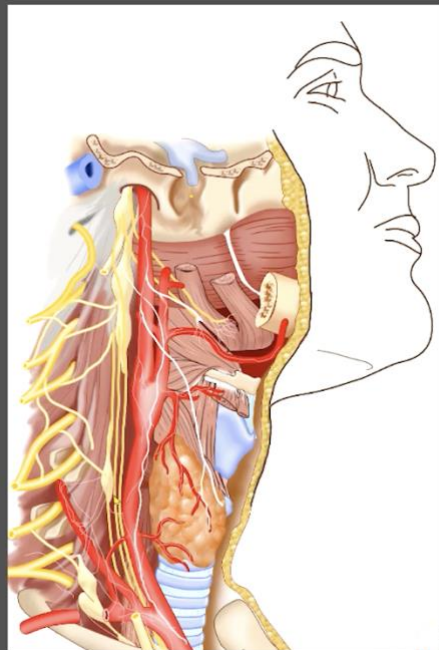
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VAGUS NERVE SCHWANNOMA- WILL BE DISPLACING THE IJV POSTERIOR LATERALLY AND CAROTID ARTERIES ANTERIORLY.

BUT, THE SYMPATHETIC NERVE TUMOUR WILL DISPLACE BOTH CAROTID ARTERIES AND IJV ANTERIORLY.

### SNS

- superior cervical ganglion
- middle cervical ganglion
- cervicothoracic ganglion (also called the stellate ganglion)



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## LAYERS OF FASCIA FORMING CAROTID SHEATH

# Layers of the Deep Cervical Fascia

