

# Extreme low-lying carotid bifurcations

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A 52-year-old male with no past medical history was referred to the transient ischemic attack (TIA) clinic following an event at home. The transient symptoms were of an inability to move his left arm and leg for a period of approximately 15 minutes. The patient denied any numbness of the face, headaches and no blurring of vision. A careful history revealed two previous transient attacks of blurred vision approximately 1-2 years prior to this presentation. He had no other co-morbidities or associated syndromes.

Given this history, suggestive of TIA(s) in the right anterior circulation, an ultrasound examination of the carotid vessels was performed to include or exclude an atherosclerotic source of embolus. The ultrasound scan demonstrated an extremely short common carotid artery (CCA) of just 2.5 cm on the right, with apparently normal flows and velocities in both the external and internal carotids (ECA and ICA) but poor views of the bifurcation. Similarly, the flows and velocities in the left ICA and ECA were also normal with the carotid bulb lying low in the base of the neck, so further imaging with a magnetic resonance angiogram (MRA) was performed (Panel A) to clarify the anatomic and ultrasound findings. This confirmed extremely low-lying bilateral carotid bifurcations (highlighted in Panel A). The short, right-side CCA bifurcates at the level of C7 / T1 (Panel B) and the left carotid bifurcation is at the level of C6 / C7 (Panel C).

Carotid artery bifurcation is most frequently at the level of C3–C5, but instances of bifurcation as low as T4 and as high as C1 have been reported<sup>1, 2</sup>. Whilst 0.15% of the population may have one bifurcation as low as C6<sup>1</sup>, bilateral low-lying bifurcation is very rare, and intrathoracic bifurcation is featured in only a handful of case reports with a notable association with Klipper-Feil syndrome<sup>1, 3</sup>. Knowledge of vascular anatomy is essential for interpreting images for patients undergoing invasive procedures such as carotid

endarterectomy. High bifurcation is a more common variant, but low-lying bifurcation may cause problems during neck dissections. Furthermore, extreme low-lying bifurcation of the carotid would be one of the few indications to consider endovascular stent placement over surgical endarterectomy.

Although no cause was found for this gentleman's symptoms, considerable care must be taken when assessing carotid disease and planning carotid artery interventions. It is important to be aware of anatomical variation to prevent vessel and nerve injury.

Panel Panel B



Panel C



## References

1. Gailloud P, Murphy KJ, Rigamonti D. Bilateral thoracic bifurcation of the common carotid artery associated with Klippel-Feil anomaly. *AJNR American journal of neuroradiology* 2000;21(5): 941-944.
2. Gulsen S, Caner H, Altinors N. An anatomical variant : low-lying bifurcation of the common carotid artery, and its surgical implications in anterior cervical discectomy. *Journal of Korean Neurosurgical Society* 2009;45(1): 32-34.
3. Rielly JP. Intrathoracic carotid bifurcation in Klippel-Feil syndrome. *Journal of vascular surgery* 2008;47(5): 1071-1073.