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Pulsatile Neck Swelling: A High Riding Brachiocephalic Trunk with Retropharyngeal Internal Carotid Artery - Case Report

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Abstract: ***Anatomical variations in the branching of brachiocephalic trunk have been classified previously and similarly has been described the variations of the course of internal carotid artery including its retropharyngeal location; although their occurrence together is rare and seldom described. Here we report such a rare case of co-existing high riding brachiocephalic trunk presenting as anasymptomaticpulsatile antero-lateral neck swelling in a 55-year-old female detected using screening ultrasound with doppler examination and incidentally detected retropharyngeal right internal carotid artery diagnosed using contrast enhanced computed tomography of neck; Thus, highlighting the importance of screening and assessment of these variations in surgical procedures of neck due to surgical challenges and potential possibility of catastrophic bleeding associated with them.***

Keywords: Pulsatile neck mass

1.Introduction

Anterior neck swellings are a common presentation in otorhinolaryngology clinic. Although, 60% of the vascular anomalies of the whole body present in head and neck [1], <1% neck swellings are due to vascular malformations [2], thus being a rare differential diagnosis. In our patient, the reason for an asymptomatic, pulsatile, right anterolateral neck swelling was due to high riding brachiocephalic trunk, and along with this, was discovered a retropharyngeal course of ipsilateral ICA, that makes our case extremely rare.

Both of these anomalies pose a surgical challenge involving procedures of head and neck e. g., tracheotomy, nasotracheal intubation, tonsillectomy etc. and need prior screening to avoid complications during the procedure.

2.Case History

A 55-year-old female presented with complaints of a neck mass in the right inferomedial part of neck (Fig.1), noticed 5 years back incidentally, with no progression or associated complaints.

On examination, swelling was located in right supraclavicular region, approximately 4 X 4 cm size, abutting sternoclavicular joint medially, pulsatile synchronous with heartbeat, compressible swelling with no overlying skin changes, non-tender, no local rise of temperature. Bilateral peripheral pulses examined were normal, with no radio-radial or radio-femoral delay. Rest of neck examination, oral cavity, nose and systemic examination were clinically normal.

The patient is a known case of hypertension for 10 years with good control on dietary restrictions and oral Amlodipine 10 mg.

Based on the clinical features, a provisional diagnosis of a vascular malformation of the neck was made with the probabilities of arteriovenous malformation, brachiocephalic trunk or common carotid artery aneurysm, or a carotid body tumour. An ultrasonography with doppler study was obtained that reported as a high riding aberrant brachiocephalic trunk. Contrast Enhanced Computed Tomography for neck was obtained for precise details about the aberrant vascular anatomy that reported an abnormally high riding brachiocephalic trunk with bifurcation above sternoclavicular joint with tortuous right CCA causing bulge over right neck anteriorly (Fig. 2a-d). Incidentally a right sided retropharyngeal ICA was also found with normal calibre.

A thorough fibreoptic nasopharyngeal, oropharyngeal and laryngeal examination was done post CT report that was clinically normal and revealed no bulge/ swelling in the posterior pharyngeal wall.

A Cardio-Thoracic-Vascular Surgery opinion was taken for the anomaly and for need of any medical or surgical intervention needed actively, which was denied by the CTVS experts and the patient was advised to keep a close follow up along with thorough counselling of the patient from them about the benign asymptomatic nature of the anomaly and potential risk involved in future surgical procedures of the neck. Patient was reassured of the condition from our side also and educated adequately about the anomaly that helped alleviate the concerns and questions that patient had regarding the neck swelling. Documentation of the same in patient's medical records was done for future reference and she was advised to keep a follow up for any complaints arising.

3.Discussion

Neck swelling is a common presentation to the otorhinolaryngology clinic. A pulsatile mass over the neck is an unusual presentation which may indicate a vascular anomaly such as carotid body tumour, arteriovenous malformation or aneurysm of brachiocephalic or common carotid artery [3].

In a suspected vascular lesion, fine needle aspiration for cytology or surgical biopsy should not be performed as the procedures may cause massive bleeding. Doppler ultrasonography has been the first diagnostic modality utilized in the management of patients with vascular malformations, due to low-cost, non-ionizing technology and the ability to provide lesions' flow characteristics [4]. CT, MRI and angiography can be used for further precise assessment of surrounding soft tissue details and to define the whole extent of the anomaly.

In our case, confirmation of high riding brachiocephalic trunk was made on USG with doppler, and then we proceeded with contrast enhanced CT scan of the neck which revealed the diagnosis of a high riding brachiocephalic trunk and tortuous common carotid artery causing the pulsating neck swelling with incidental finding of right sided retropharyngeal course of Internal Carotid artery.

The brachiocephalic artery or brachiocephalic trunk, or more commonly referred to clinically as the innominate artery, is one of the three great vessels of the aortic arch that supplies blood to the head, neck and upper extremities. Specifically, the artery goes on to form the right subclavian artery, which provides blood to the right upper extremity, and the right common carotid artery, which is one of the main arteries supplying blood to the head and neck [5].

In normal anatomy, the innominate artery is the most proximal branch of the aortic arch. It arises to the right of and anteriorly to the left common carotid artery. The artery is short in length and courses superiorly and posteriorly from the aortic arch until it bifurcates into the right subclavian artery and the right common carotid artery at about the level of the sternoclavicular joint. Along its short course, it typically crosses from left to right anterior to the trachea around the ninth tracheal ring. However, due to anatomic variation, it is not uncommon for it to cross at any level from around the sixth ring to the thirteenth ring [6].

The brachiocephalic trunk or innominate artery develops from two components-the aortic sac and the proximal right fourth aortic arch. Persistence of a portion of the proximal segment of the right fourth aortic arch causes the elongation of the brachiocephalic trunk superiorly leading to a high riding brachiocephalic trunk [1], [7], [8].

The exact incidence of high riding innominate artery is scarce and yet to be discovered [9].

Most presentations are asymptomatic and detected incidentally during procedures involving neck like tracheostomy, thyroid, parathyroid or laryngeal surgeries or during diagnostic work up of pathologies of the same. [9] Presentation of stridor (due to tracheal compression) [10] and post tracheostomy bleed (due to tracheo-arterial fistula formation) has also been reported [11].

Such anatomical variations are of paramount clinical significance since they constitute major risk-factors of accidental haemorrhage when performing tracheotomy, surgeries of the thyroid and parathyroid glands, in the tumour excision of the neck and invasive radiology as well [9], when clinically asymptomatic or presenting as a benign asymptomatic swelling that might be ignored by most patients.

Fundamentals to avoid iatrogenic injury are: (1) exposure of the trajectory and the origin of BCT, since it is quite evident that probable novel anatomic variations could be unexpectedly detected during the operation (2) good haemostasis and (3) preoperative utilization of diagnostic ultrasound [12].

As mentioned earlier, our patient also revealed an incidental finding of right sided retropharyngeal ICA.

The incidence of retropharyngeal ICA has been estimated at 4.5% with female dominance (65.9% females, 34.1% males) and is believed to become more pronounced with increasing age, the mean age being 68.89±10.69 years [13].

The common carotids traverse up into the neck through the carotid sheath, where they finally bifurcate into the external and internal carotid arteries at the level of the carotid sinus and the fourth cervical vertebra (C4), in the parapharyngeal space [14].

The internal carotid artery has a straight cervical course, posterior and lateral to the pharyngeal wall, up to the cranial base, and does not emit branches in the region of the neck. The aberrations of the course of internal carotid artery can be classified in three categories: tortuosity, kinking, and coiling; the tortuosity can be of variable degree, the most extreme being its retropharyngeal transposition [15].

With aging, the aortic arch elongates, thus causing the cervical part of the ICA to buckle to accommodate the reduced distance between its proximal and distal ends. For older people, age-related loss of vascular wall elasticity and reduced arterial compliance may be the possible causative factor. Such anomalies may often be associated with arteriosclerosis, diabetes mellitus and systemic arterial hypertension [13]. This is consistent with the age, sex and associated co-morbidity in our patient.

The retropharyngeal trajectory of the ICA usually can present as a mass or swelling in the posterior pharyngeal wall and has been related with higher risk of haemorrhage and mortality during surgery, endotracheal intubation, infection dissemination, abscess drainage, biopsies, neoplasms, or any surgical procedure involving the pharyngeal wall [15].

Most of the patients with retropharyngeal internal carotid arteries are asymptomatic as it was in our patient. When symptoms are present, dysphagia, dysphonia, and cervical bolus sensation, as well as glossopharyngeal neuralgia, have been reported [16].

Hence, even though the incidence of neck swellings resulting from vascular malformations in <1% [2], a high clinical suspicion and screening procedures are required for a patient presenting with complaints of neck swelling before opting for fine needle aspiration cytology or biopsy from the swelling due to possible adverse outcomes that may even be life threatening as with cases with common carotid or brachiocephalic artery aneurysms, or as in our case with a high riding brachiocephalic artery. A pulsatile neck swelling that is cystic in consistency should aware the attending surgeon of a high probability of vascular malformation and becomes a necessity for ultrasound with doppler guided screening to look for the nature of swelling. In case of diagnosis of a vascular malformation on USG with doppler screening, further imaging using CT or MRI becomes must be opted for precise details of the aberrant neck vascular anatomy and surrounding soft tissue details and detection of incidental associated malformations, like in our case was a retropharyngeal course of ipsilateral ICA.

4.Conclusion

Although vascular neck swellings are a frequent presentation in the clinic, a high riding brachiocephalic trunk presenting as a lateral neck swelling is a rare, asymptomatic condition that can lead to potentially catastrophic consequences during various surgical procedures if ignored. Similarly retropharyngeal course of ICA is a vaguely symptomatic or asymptomatic condition that can lead to similar complications. Thus, thorough evaluation with the use of USG and CECT in essentially needed for a suspected vascular swelling before a plan for FNAC or biopsy is made to avoid such complications. Here we also highlight the need of diagnostic USG screening for aberrant course of the vessels before surgical procedures involving the neck as an efficient and accessible screening procedure.

Patient education about the condition is very important to alleviate the possible doubts regarding the neck swelling and explain the benign nature of the condition to abolish patient's anxiety regarding the same and prevent adverse psychological affect. Also, documentation in patient's medical records is essential for reference to avoid such complications of neck surgery in the future.

References

[1] U. Ernemann *et al.*, "Current concepts in the classification, diagnosis and treatment of vascular anomalies," *Eur. J. Radiol.*, vol.75, no.1, pp.2-11, 2010, doi: 10.1016/j. ejrad.2010.04.009.
[2] A. Irfana, S. Rai, and K. S. G. Somayaji, "Benign neck swellings: a clinico-radio-pathological study," *Int. J. Otorhinolaryngol. Head Neck Surg.*, vol.5, no.2, p.285, 2019, doi: 10.18203/issn.2454-5929. ijohns20190445.
[3] I. Mohamad, M. A. F. Khalid, and A. H. A. Karim, "A pulsating mass in the pre-auricular region," *Malaysian Fam. Physician*, vol.9, no.1, pp.35-36, 2014.
[4] K. Samadi and G. M. Salazar, "Role of imaging in the diagnosis of vascular malformations vascular malformations," *Cardiovasc. Diagn. Ther.*, vol.9, no.12, pp. S143-S151, 2019, doi: 10.21037/CDT.2018.08.06.
[5] "Anatomy, Thorax, Brachocephalic (Right Innominate) Arteries-StatPearls-NCBI Bookshelf. "
[6] P. K. Wang, P. S. Yen, M. H. Shyr, T. Y. Chen, A. Chen, and H. T. Liu, "Endovascular repair of tracheo-innominate artery fistula," *Acta Anaesthesiol. Taiwanica*, vol.47, no.1, pp.36-39, 2009, doi: 10.1016/S1875-4597 (09) 60019-9.
[7] I. Janota, *Clinical Neuro Anatomy*, vol.43, no.11.1980. doi: 10.1136/jnnp.43.11.1050.
[8] C. F. De Garis, I. H. Black, and E. A. Riemenschneider, "Patterns of the Aortic Arch in American White and Negro Stocks, with Comparative Notes on Certain Other Mammals., " *J. Anat.*, vol.67, no. Pt 4, pp.599-619, 1933, [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/17104452%0A http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1249330
[9] T. Mishra, G. Raj, and S. Dwivedi, "High riding innominate artery: An unusual pulsatile pretracheal mass," *Radiol. Case Reports*, vol.16, no.7, pp.1732-1735, 2021, doi: 10.1016/j. radcr.2021.04.018.
[10] A. Borges, S. Ramalho, and L. Ferreira, "Common carotid artery trifurcation: a potentially dangerous anatomical variant," *BMJ Case Rep.*, vol.14, no.2, pp.1-3, 2021, doi: 10.1136/bcr-2020-241104.
[11] H. A. Dalati, M. S. Jabbr, and J. Kassouma, "High-riding brachiocephalic (innominate) artery during surgical tracheostomy," *BMJ Case Rep.*, vol.2018, 2018, doi: 10.1136/bcr-2017-221802.
[12] M. Zarokosta *et al.*, "Anatomical variation of the trajectory of the brachiocephalic artery encountered during parathyroid adenoma excision. A rare case report and a surgical challenge," *Int. J. Surg. Case Rep.*, vol.58, pp.138-141, 2019, doi: 10.1016/j. ijscr.2019.04.007.
[13] W. ping Zhu, X. Fang, O. Chooah, S. M. Albaqali, and W. Lin, "Retropharyngeal internal carotid artery: a potential risk factor during nasotracheal intubation," *Surg. Radiol. Anat.*, vol.43, no.11, pp.1769-1776, 2021, doi: 10.1007/s00276-021-02784-9.
[14] M. Charlick and J. M Das, "Anatomy, Head and Neck, Internal Carotid Arteries," *StatPearls*.2020. [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/32310521
[15] M. B. Garrido, R. Jagtap, and M. Hansen, "Retropharyngeal internal carotid artery: a review of three cases," *Oral Maxillofac. Surg.*, vol.24, no.2, pp.255-261, 2020, doi: 10.1007/s10006-020-00845-8.
[16] J. Pfeiffer and G. J. Ridder, "A clinical classification system for aberrant internal carotid arteries," *Laryngoscope*, vol.118, no.11, pp.1931-1936, 2008, doi: 10.1097/MLG.0b013e318180213b.

Images

Figure 1: clinical photograph of right pulsatile anterior swelling

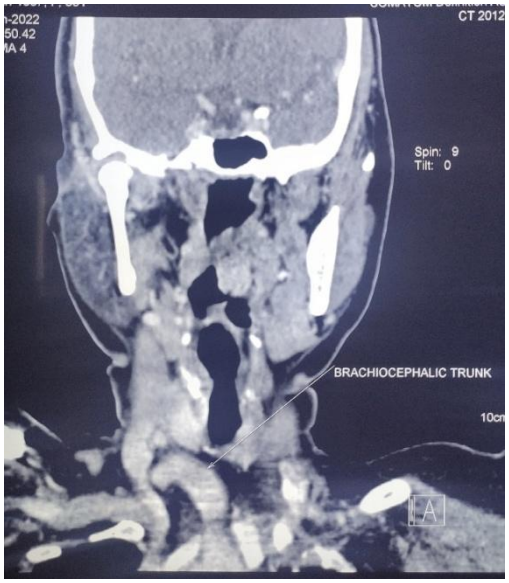

Figure 2a: CECT Neck coronal view showing high riding brachiocephalic trunk

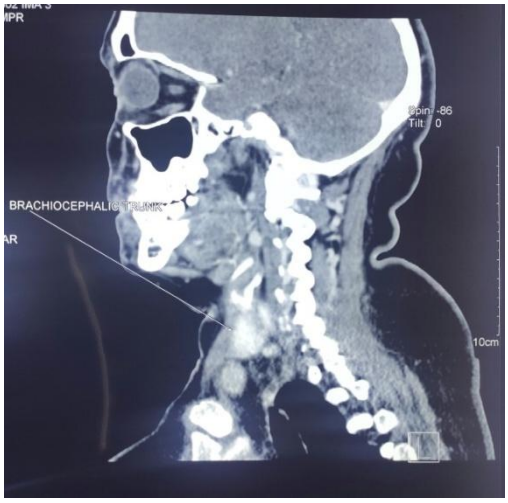

Figure 2b: CECT Neck parasagittal view showing high riding brachiocephalic trunk

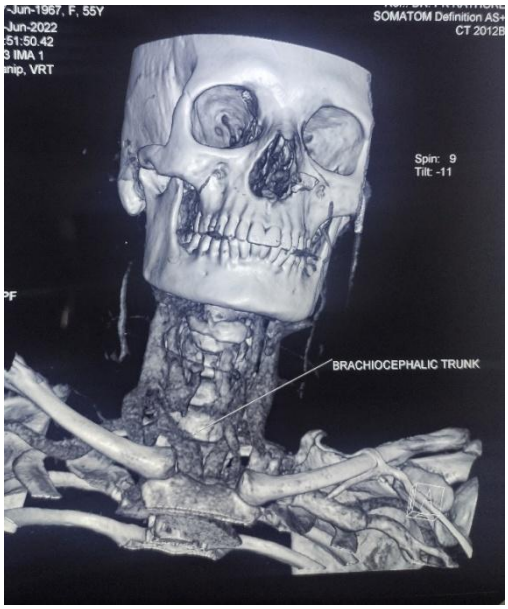

Figure 2c: 3D reconstruction of CECT Neck showing high riding brachiocephalic trunk

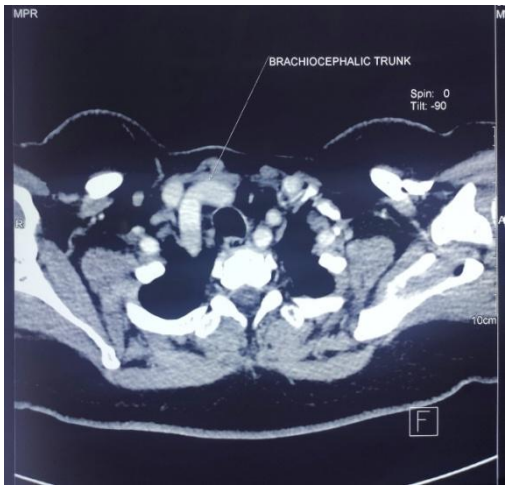

Figure 2d: CECT Neck axial cut showing high riding brachiocephalic trunk