Aberrant high-riding innominate artery and right internal carotid artery in the retropharyngeal space

Mudali Denis Mathavhane, Orapeleng Seboco, Bafana Elliot Hlatshwayo

ABSTRACT

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Case Report: A 63-year-old female who presented with a pulsatile anterior neck mass was referred for imaging. A neck contrast-enhanced computed tomography (CECT) scan revealed an aberrant high-riding IA crossing anterior to the trachea just inferior to the thyroid gland. A retropharyngeal right cervical ICA was also found at the second vertebral body level.

Conclusion: Although both of these variants are rare, they are of significance because they can cause fatal hemorrhage during neck surgical and anesthetic procedures if not recognised during imaging.

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CASE REPORT

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Keywords: Aberrant, Innominate Artery (IA), Right cervical internal carotid artery (ICA)

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INTRODUCTION

Anatomic variations of the branching pattern of the aortic arch are well documented, however, a high-riding innominate artery (IA) ascending as far as the thyroid gland is an uncommon occurrence [1]. Similarly, retropharyngeal transposition of the right cervical internal carotid artery (ICA) is a rare anatomic variant [2]. As per our knowledge, no case of high-riding innominate artery with unilateral right retropharyngeal cervical ICA in the same patient has previously been reported. Though rare, given their anatomic locations, these variants can have devastating complications for the patient during neck surgery whereas retropharyngeal ICA can also complicate endotracheal intubation [1]. High riding IA can be asymptomatic or present with a pulsatile neck mass and patients can also present with respiratory problems due to tracheal compression by the IA. In addition to being asymptomatic and abnormal pulsation in the posterior pharyngeal wall, retropharyngeal ICA may present with symptoms such as dysphagia and fullness in the throat [2, 3]. Medial deviation of the ICA can mimic a parapharyngeal neoplasm and is a rare cause of widening of the retropharyngeal space [3]. Computed tomography

Mudali Denis Mathavhane¹, Orapeleng Seboco², Bafana Elliot Hlatshwayo³

Affiliations: ¹Registrar, Diagnostic Radiology and Imaging, Polokwane Mankweng Hospital Complex and university of Limpopo, Polokwane, Limpopo Province, South Africa; ²Medical Officer, Diagnostic Radiology and Imaging, Polokwane Mankweng Hospital Complex, Polokwane, Limpopo Province, South Africa; ³Senior Specialist, Diagnostic Radiology and Imaging, Polokwane Mankweng Hospital Complex, Polokwane, Limpopo Province, South Africa.

Corresponding Author: Mudali Denis Mathavhane, P.O Box 11216, Bendor, Limpopo Province 0713, South Africa, Ph: +27763311088; Email: mathavhane@yahoo.co.uk

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(CT) scan or magnetic resonance imaging (MRI) scan are non-invasive imaging modalities that are preferred over conventional angiography in the imaging of vascular anomalies of the neck [4]. We describe a case of a patient with an aberrant course of the IA and an aberrant right cervical ICA detected on CT angiography and emphasize their clinical significance.

CASE REPORT

A 63-year-old female with moderate dysplasia of the cervix/cervical intraepithelial neoplasia 2 (CIN 2) and had requested hysterectomy. She is hypertensive and human immunodeficiency virus (HIV) positive on treatment. A pulsatile right anterior neck mass was found during a general examination prior to a planned total abdominal hysterectomy (TAH). At presentation, the blood pressure was 140/85 mmHg, pulse 90 beats/min, temperature 36.5°C and she was breathing normally at room air. Her laboratory blood tests showed: CD4 count of $628 \times 10^6/L$. Her full blood count (FBC) and urea and creatinine (U&E) results were normal. Contrast-enhanced computed tomography (CECT) scan of the neck showed the innominate artery ascending above the sternoclavicular joint (Figures 1 and 2) lying anterior to the trachea (Figure 2) and extending to the inferior border of the thyroid gland where it divided into the right common carotid and right subclavian arteries. Transposition of the right cervical ICA into the retropharyngeal space (Figures 3–5) was also noted. The rest of the neck vasculature was unremarkable. The neck findings were communicated to the referring doctor and TAH was proceeded with under general anesthesia. No complications was experienced during intubation or surgery and the patient was discharged seven days after surgery. Microscopic examination of the cervix post TAH showed features of severe dysplasia (CIN 3). On her follow-up visits, there were no post-surgical complications reported. No surgical intervention was planned for the vascular variants, however, these variants were documented in the patient's medical record for future reference in case the patient needs neck surgical or anesthetic procedures to be performed.

DISCUSSION

The IA develops from the aortic sac and the proximal right fourth aortic arch [5]. IA arises as the first and largest branch of the aortic arch and courses superiorly to the right to divide into the right common carotid and subclavian arteries behind the sternoclavicular joint [6]. It has been suggested that a potential cause of high-riding IA might be due to persistence of a longer portion of the proximal segment of right fourth aortic arch [7].

Carotid arteries are embryologically derived from the ipsilateral third arch and dorsal Aorta [5]. Both carotids

Figure 1: Contrast-enhanced computed tomography scan of neck coronal view showing innominate artery (black arrow) ascending above the sternoclavicular joint turning inferior to the thyroid gland before dividing into right common carotid and subclavian arteries.

pass obliquely upward and divide into external carotid artery and ICA at the level of the superior border of the thyroid cartilage [1]. The ICA anatomic course may have the following variations: (a) straight course to skull base, (b) S- or C- shaped elongation with medial, lateral, or ventrodorsal displacement, (c) kinking of one or more of the segments, and (d) coiling of the artery that may appear as a double loop [3]. Aetiology of the above variations has been attributed to embryologic, pathologic, and ageing effects [3]. Retropharyngeal transposition may be ascribed to incomplete straightening of carotids during descent of the aortic root [8].

Variations in the trajectory of the carotids are believed to become more evident with increasing age [1].

Radiological findings of high-riding innominate artery and bilateral retropharyngeal carotid arteries in the same patient have only been reported once [1]. Unlike the case reported by Dua et al. [1], the case we report has a high IA and unilateral retropharyngeal right ICA at the level of the dens.

Radiologists play a critical role of alerting otolaryngologists and anesthetists of any variant vascular anatomy in the neck prior to intervention because of the risk of injury during intubation and neck surgery [2].

Figure 2: Contrast-enhanced computed tomography scan of neck coronal view showing medial deviation of right internal carotid artery (white arrow) and innominate artery (black arrow) ascending above the sternoclavicular joints.

Figure 3: Contrast-enhanced computed tomography scan of neck axial view showing the innominate artery anterior to the trachea.

High-riding IA may cause fatal complications from massive hemorrhage if not recognized during neck surgeries such as tracheostomy, thyroidectomy, mediastinoscopy [6]. An abnormally horizontal or high

Figure 4: Contrast-enhanced computed tomography scan of neck axial view showing the right internal carotid artery medial deviation into retro pharyngeal space at the level of C2 vertebral body.

Figure 5: Contrast-enhanced computed tomography scan of neck sagittal view showing the right internal carotid artery in the retropharyngeal space at C2 vertebral body level.

IA predisposes patients to life-threatening tracheo-innominate fistula following tracheostomy [9].

Retropharyngeal ICA predisposes patients to devastating complications resulting from biopsy, surgical and anesthetic procedures. Due to its aberrant course the ICA is vulnerable to rupture and pseudoaneurysm formation following diagnostic procedures such as pharyngoscopy or transoesophageal echocardiography and oropharyngeal surgery, such as tonsillectomy, adenoidectomy, pharyngoplasty, and transoral approaches to neurosurgical procedures [1].

For the anesthetist, retropharyngeal ICA poses a risk of arterial puncture or arterial injection of local anesthetics during a transoral approach to block the glossopharyngeal nerve in the pharynx [3, 10].

It has been suggested that retropharyngeal ICA could cause obstructive sleep apnea and predispose the patient to cerebral vascular insufficiency [10].

Retropharyngeal ICA requires no intervention, however, once diagnosed it should be clearly documented in the patient's medical record to avoid complications should the patient require any type of oral or cervical surgical intervention in the future [3].

CONCLUSION

In summary, we reported a rare case of an aberrant high-riding innominate artery and unilateral retropharyngeal internal carotid artery (ICA). Awareness and accurate descriptions of these variants by radiologists can prevent fatal complications during neck surgical and anesthetic procedures.

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Author Contributions

Mudali Denis Mathavhane – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Orapeleng Seboco – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Bafana Elliot Hlatshwayo – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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