

MDCT of right aortic arch with aberrant left subclavian artery associated with kommerell diverticulum and calcified ligamentum arteriosum

Rene Epunza Kanza, Michel Berube, Pierre Michaud

Rene Epunza Kanza, Michel Berube, Department of Radiology, Chicoutimi Hospital, Saguenay, Quebec G7H5H6, Canada
Rene Epunza Kanza, Department of Radiology, Faculty of Medicine, University of Sherbrooke, Sherbrooke, Quebec J1H5N4, Canada

Pierre Michaud, Department of Surgery, Cardiothoracic Unit, Chicoutimi Hospital, Saguenay, Quebec G7H5H6, Canada

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Correspondence to: Dr. Rene Epunza Kanza, MD, PhD, Clinical Assistant Professor, Department of Radiology, Chicoutimi Hospital Affiliated with Sherbrooke University, 305 Rue Saint-Vallier, Saguenay, Quebec G7H5H6, Canada. rn.kn.01@gmail.com

Telephone: +1-418-5411234 Fax: +1-418-5435104

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Abstract

We present a case of the right aortic arch with kommerell diverticulum (KD) and aberrant left subclavian artery in a symptomatic 50-year-old patient with a calcification in the presumed attachment site of the ligamentum arteriosum (LA) to the KD. In another 30-year-old male patient, the entire course of a calcified LA was demonstrated using multidetector row computed tomography.

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Key words: Multidetector row computed tomography; Right aortic arch; Aberrant left subclavian artery; Kommerell diverticulum; Calcification of ligamentum arteriosum

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INTRODUCTION

Right aortic arch with aberrant origin of left subclavian artery is rare congenital variation of the aortic arch and its branches with a reported prevalence of 0.05%-1% in the literature^[1]. This anomaly is frequently an incidental findings during autopsies series or angiographic studies because it is usually asymptomatic, but rarely may be symptomatic especially when there is a partial or complete obstruction of the oesophagus and/or trachea.

With the recent development of newer non-invasive imaging systems, the use computed tomography and magnetic resonance imaging (MRI) in daily practice has been increase to diagnose and characterize anomalies of aortic arch and its branches including vascular ring. Despite this, the last part or the complete vascular ring which is made by left-side ligamentum arteriosum is often not clearly visualized pre-operatively.

We present multidetector row computed tomography (MDCT)-angiographic findings of a case of right aortic arch (RAA) with aberrant left subclavian artery (ALSA) associated with Kommerell diverticulum and calcified ligamentum arteriosum causing dysphagia lusoria. In another patient, we emphasize the role that MDCT may play to demonstrate calcified ligamentous arteriosum (LA).

CASE REPORT

Case 1

A 50-year-old man was referred to our department for investigation of dysphagia.

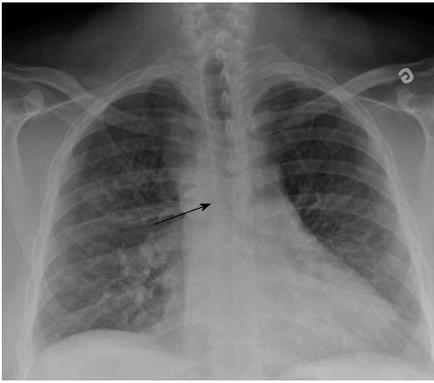


Figure 1 Chest X-ray scan showing the right aortic knob and arch as well as slight shift of the inferior trachea to the left (arrow).

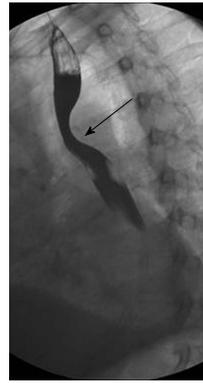


Figure 2 Barium esophagogram showing the posterior compression of the esophagus (arrow) in the oblique view.



Figure 3 Multidetector computed tomography of the right aortic arch with an aberrant left subclavian artery in a 50-year-old man with dysphagia. Axial (A) and coronal (B) multiplanar reformatted and maximum intensity projection (C) images showing the kommerell diverticulum (white arrow). Note the calcification in the presumed aortic insertion site of the ligamentum arteriosum (black arrows).

The patient had a long history of arterial hypertension, type II diabetes mellitus, and sleep apnea syndrome and was newly diagnosed with ischemic cardiac disease. A chest X-ray showed a right aortic knob and arch with mild tracheal deviation to the left (Figure 1).

A barium esophagogram showed posterior compression of the esophagus (Figure 2).

MDCT-angiography was performed using a 16-slice MDCT scanner (LightSpeed 16, GE Healthcare, WI, Milwaukee, United States). CT parameters included 2.5-mm slice thickness, gantry rotation time 0.5 s, 120 Kvp and 300 mA. The scanning delay was determined with a bolus tracking technique. The true CT study was obtained after administration of 120 cc of contrast medium at the rate of 4 cc/s. Multiplanar, maximum intensity projection and three dimensional volume-rendered reformations were obtained using a separate workstation (Voxar 3D in im-pax 6.3; Agfa).

MDCT-angiography demonstrated RAA with a kommerell diverticulum (KD) and an ALSA (Figure 3A and B). Additionally, calcification was found in the presumed site of the superior attachment of LA to the KD (Figure 3C).

Because of multiple comorbidities and relatively non-disabling dysphagia, surgery was postponed and priority was given to thoroughly investigating the patient's cardiac disease and controlling all the comorbidities before safe surgery could be planned.

Case 2

A 30-year-old referred to our department for chest CT following detection of 6 mm lung nodule in the right lung base during abdominal CT performed for abdominal pain investigation. The chest CT shows calcification of the entire course of the ligamentum arteriosum as an incidental findings (Figure 4)

DISCUSSION

Right aortic arch with aberrant origin of left subclavian artery is one of the commonest mediastinal vascular ring. This anomaly is often asymptomatic and most of

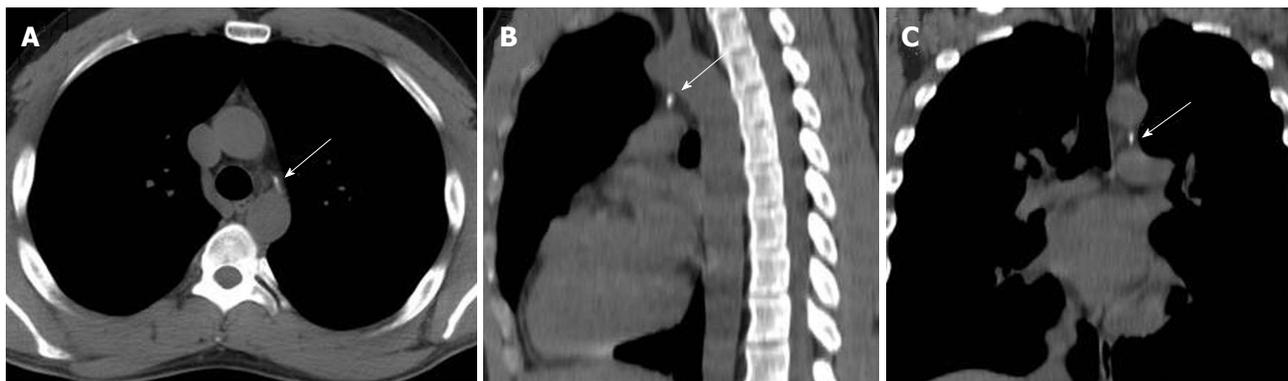


Figure 4 Non-contrast computed tomography in another patient. A 30-year-old asymptomatic man. Axial (A), coronal (B) and sagittal (C), reformatted images demonstrating the course of the calcified ligament arteriosum (arrows).

patient will remain symptom-free in their life time. Rarely patients may present symptoms in early life time or become symptomatic in young adulthood or later due the compression of the oesophagus and/or trachea leading to dysphagia and/or dyspnoea. Surgery may be required if symptoms are moderate or severe. We present a new case of RAA with ALSA and KD causing adult onset of dysphagia lusoria. The diagnosis was suggested by the chest X-ray and barium esophagram but confirmed by MDCT-angiography with better characterization of the vascular ring.

This case illustrates the role of MDCT-angiography in the diagnosis of RAA with KD and ALSA. This role is quite similar with those of MRI. Although CT and MRI are very useful for the diagnosis of a vascular ring in routine clinical practice, the last part of the ring in a complete vascular ring, which is made by the LA, is often not clearly seen preoperatively, to guide surgical division. Several recent studies have shown that with modern imaging techniques, especially CT, the rate at which LA calcification is being detected has increased, varying from 11.2% to 48%^[2,3]. Calcification usually occurs at the aortic end of the LA - or at the KD near the take-off of the ALSA; it may even show patterns, including curvilinear, clumped, punctuate or linear^[3] (Figure 4).

In their recent article, Paparo *et al*^[4] show that MRI could be a powerful imaging tool for the diagnosis of vascular rings and may be useful for demonstrating the

course of the LA. However, we believe in case of LA calcification, MDCT may be superior to MRI. Further, MDCT has the advantage of being fast and widely available, while MRI may not be suitable for patients with claustrophobia, cardiac pacemakers, significant dyspnea, or the need for sedation. The main drawback of CT remains the radiation dose and the use of a contrast medium. In routine clinical practice, the choice of modality may depend mainly on the patient's age, type of surgery (open *vs* endoscopic), and expertise at the institution where the surgery is to be conducted.

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