

Multimodality cardiac imaging for management of a cardiac mass in the era of COVID-19: a case report

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Background

Atrial myxomas are the most common benign cardiac tumours. This case highlights an unusual presentation and complex management of a patient who was incidentally found to have a left atrial tumour concerning for a myxoma.

Case summary

A 54-year-old woman presented with symptoms of nausea and vomiting and was found to have a left atrial mass incidentally in addition to a renal infarct. She was also found to have COVID-19 and the mass was initially thought to be a thrombus. With the help of multimodality imaging, it was determined that the mass was an atrial myxoma and she was started on short-term anticoagulation to prevent recurrent embolization. After 6 weeks of anticoagulation, she successfully underwent elective resection of the mass which was confirmed to be myxoma with superimposed thrombus.

Discussion

It is difficult to differentiate cardiac tumours from intracardiac thrombus and multimodality cardiac imaging is crucial to make an accurate diagnosis. While the treatment of atrial myxomas involves early surgical resection, it becomes more complicated with concurrent COVID-19 infection.

Keywords

COVID-19 • Cardiac MRI • Atrial mass • Case report

Learning points

- To review how to choose the appropriate cardiac imaging modality in patients with COVID-19 and how to safely perform these tests in accordance with the most recent guidelines.
- To review cardiac magnetic resonance imaging features of atrial myxoma and how to differentiate myxoma from thrombus.
- To demonstrate how a short-term anticoagulation approach can be considered in patients with atrial myxoma and concurrent COVID-19 infection until surgical resection can be safely performed.

Introduction

A 53-year-old woman presented to the emergency room of a community hospital with 2 days of high fever, vomiting, and abdominal pain.

This case report was the winner of the Women in Cardiology Global Case Competition 2020 and underwent review by a judging panel arranged by that organization.

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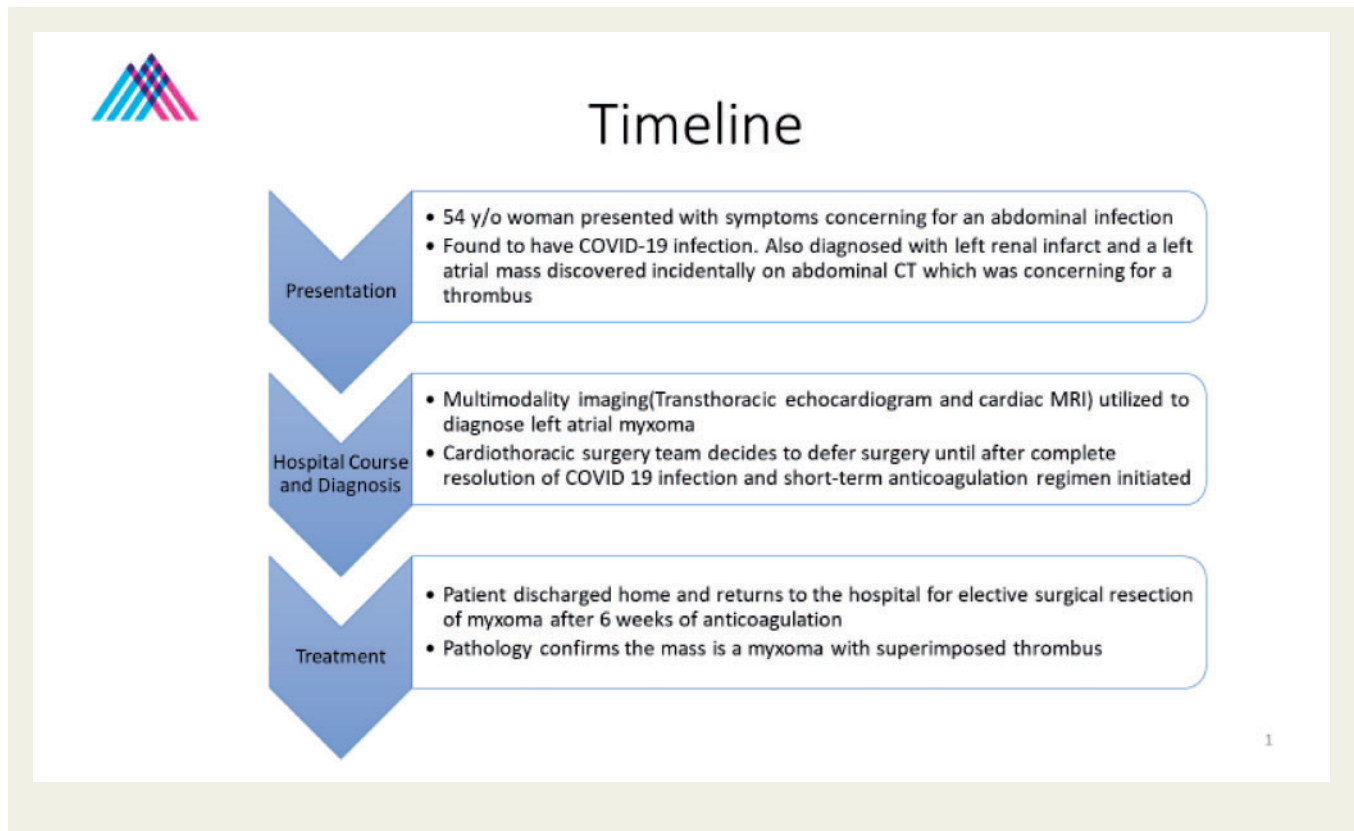
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Timeline



Case presentation

She was tachycardic, confused, and lethargic on exam. She was initially treated with empiric antibiotics and was admitted for further management of the infection. Her past medical history included hypertension, type II diabetes mellitus, non-obstructive coronary artery disease, iron deficiency anaemia, and hypothyroidism. Due to her presenting symptoms, an intra-abdominal source of infection was considered the most likely. Additionally, because of the COVID-19 pandemic, there was a high index of suspicion for COVID-19 infection. An electrocardiogram showed normal sinus rhythm. Metabolic panel, complete blood count, urinalysis, troponin I, and chest X-ray were unremarkable. D dimer (1.99 µg/L), fibrinogen (850 mg/dL), lactate dehydrogenase, and creatinine phosphokinase levels were mildly elevated. Since the patient's mental status was altered from baseline (she appeared to be confused and lethargic), a non-contrast computed tomography (CT) scan of the brain and a CT angiography of the head and neck were performed, all of which were normal.

Computed tomography scan of the abdomen and pelvis with intravenous contrast (IV) was performed. This demonstrated a left atrial mass (Figure 1) concerning for thrombus and a hypoattenuating lesion in the left kidney consistent with an acute infarction.

A screening SARS COV2 PCR was positive.

Anticoagulation therapy with intravenous heparin was initiated for the left atrial thrombus in addition to hydroxychloroquine for COVID-19 infection. The patient remained stable and was oxygenating well on

room air. An inter-hospital transfer was initiated for urgent evaluation by cardiothoracic surgery. Transthoracic echocardiogram demonstrated a well-rounded mass with frond-like projections, in the left atrium on the inter-atrial septum, likely a myxoma (Figure 2). A transoesophageal echocardiogram was considered but not performed as per recent American Society of Echocardiography (ASE) guidelines due to the high risk of aerosolization and transmission of COVID-19 associated with the procedure.¹ Due to the high predisposition for hypercoagulable state with COVID-19 infection, a cardiac magnetic resonance imaging (MRI) with IV gadolinium contrast was performed using a 1.5 Tesla GE scanner for the purpose of tissue characterization of the mass and to confirm that the mass was not a thrombus. On 2D FIESTA cine-imaging, an immobile, polypoid mass (measuring ~4.1 × 2.1 cm) was visualized in the left atrium, attached to the interatrial septum without evidence of mitral valve obstruction. In comparison to the surrounding myocardium, the mass was iso-intense on T1-weighted imaging (suggesting that it was not consistent with a lipoma) and hyperintense on T2-weighted imaging (suggesting high fluid content as is often seen with a myxoma). Partial perfusion of the mass was seen on first-pass imaging with a heterogeneous pattern of enhancement on late gadolinium enhancement imaging (Figure 3). All tissue characterization on CMR was highly suggestive of a tumour, most likely a myxoma given its location and not left atrial thrombus as was initially suspected. A small, superimposed thrombus could not be excluded. Poorly defined signal in bilateral upper lung fields was seen and was thought to be related to COVID-19 pneumonia.

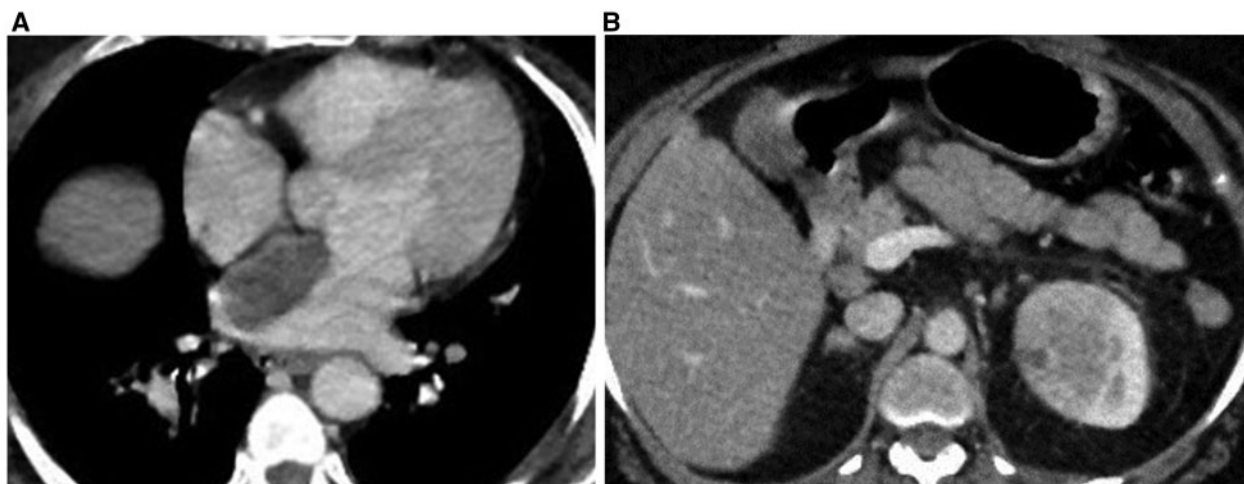


Figure 1 Computed tomography with intravenous contrast (axial view) demonstrating (A) a left atrial mass and (B) left renal infarct.

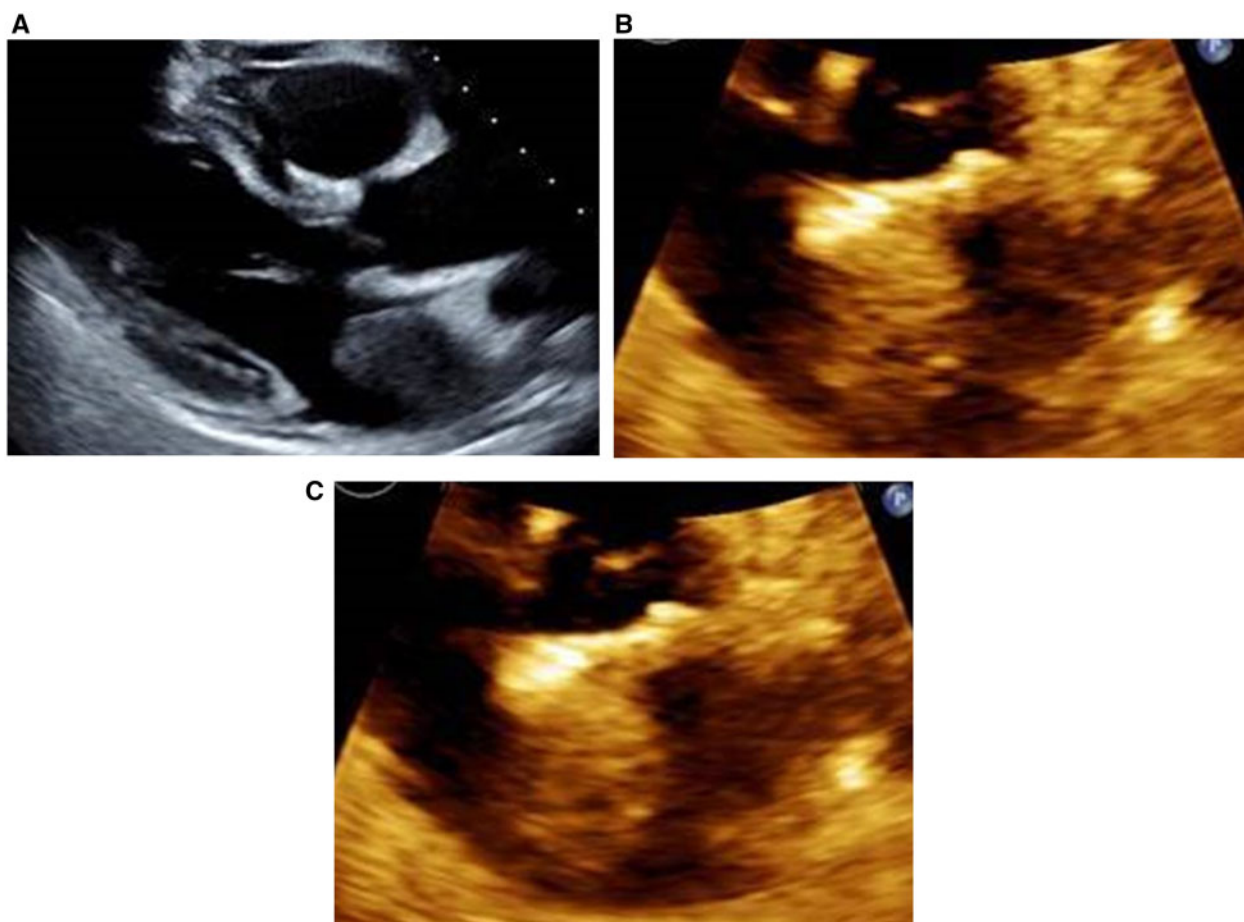


Figure 2 (A) Two-dimensional transthoracic echocardiogram, Parasternal long-axis view: left atrial mass. (B and C) Two-dimensional transthoracic echocardiogram, Focused apical four-chamber view: a rounded, sessile left atrial mass attached to the interatrial septum.

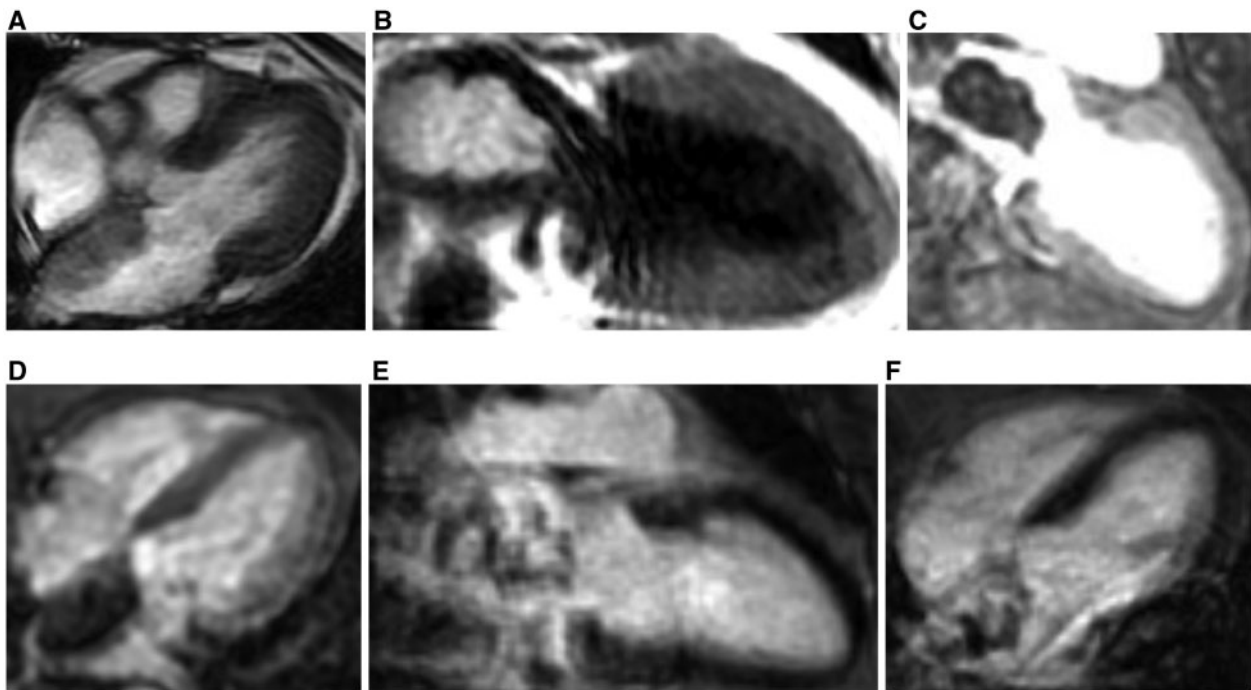


Figure 3 (A) CINE FIESTA imaging, four chamber: a rounded mass in the left atrium. (B) T2-weighted imaging, two chamber: left atrial mass appears hyperintense in comparison to the surrounding myocardium, a finding consistent with oedema. (C) First-pass perfusion, two-chamber: mild, heterogeneous pattern of perfusion of the mass is seen. (D) First-pass perfusion, four chamber: mild, heterogeneous pattern of perfusion of the mass is seen. (E) Late gadolinium enhancement imaging, two chamber: heterogeneous pattern of enhancement. (F) Late gadolinium enhancement imaging, four chamber: heterogeneous pattern of enhancement.

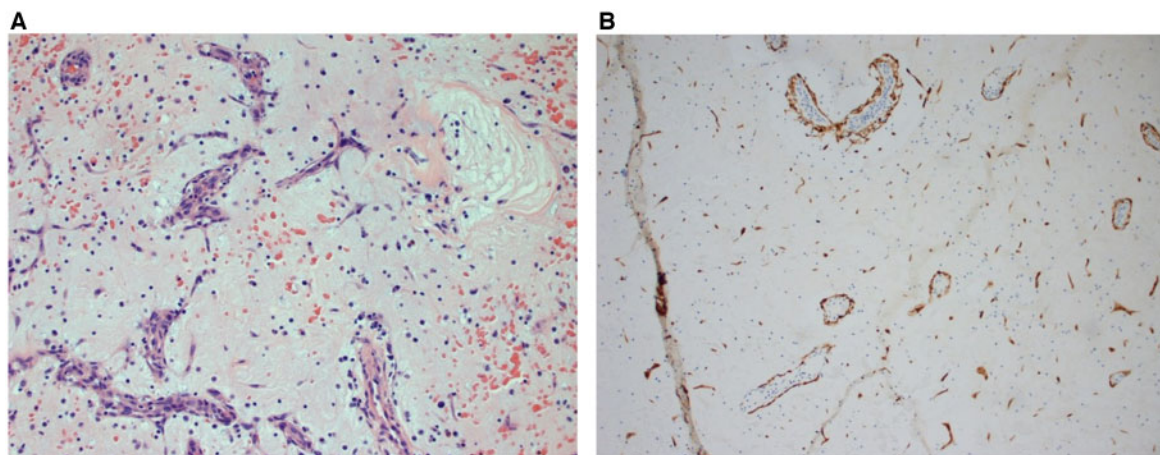


Figure 4 (A) H&E stained slide demonstrating atrial myxoma. (B) Calretinin stained slide demonstrating atrial myxoma.

Surgical intervention was deferred until after the patient's COVID-19 infection had resolved or with positive immune response due to the concern for respiratory decompensation during surgery in the setting of active COVID-19 infection. Short-term anticoagulation with Apixaban (5 mg PO BID) was continued until surgery to prevent superimposed thrombus and

recurrent embolization given the propensity for thrombus formation in patients with active COVID-19 infection.² Six weeks later, after she had recovered completely from the infection, she successfully underwent resection of the tumour. Histopathology confirmed that the mass was a myxoma with superimposed thrombus (Figure 4).

Table 1 Characteristics of cardiac masses on cardiac magnetic resonance imaging

MRI sequence	Myxoma	Thrombus	Lipoma	Angiosarcoma	Metastasis
T1-weighted Imaging	Isointense	Hypointense	Hyperintense	Heterogeneous	Hypointense
T2-weighted Imaging	Hyperintense	Hypointense	Hyperintense	Heterogeneous	Hyperintense
Late gadolinium enhancement	Heterogeneous pattern	No late gadolinium enhancement	No late gadolinium enhancement	Heterogeneous pattern	Heterogeneous pattern

Signal intensity on T1- and T2-weighted imaging is described in comparison to the myocardium. Of note, recent thrombus can appear to be hyperintense on T1- and T2-weighted imaging.⁸

Discussion

We present a patient with multiple comorbidities with COVID-19 pneumonia and an incidental left atrial mass. Primary cardiac tumours are extremely rare (0.02%).³ Atrial myxomas are the most common benign cardiac tumours.^{4,5} They are predisposed to developing superimposed thrombi, particularly if they have a villiform surface, and cause systemic embolization of either tumour tissue or of thrombi.^{5,6} Multiple studies have discussed the predilection for patients with COVID-19 to develop arterial and venous thrombi.⁷ A recent international consensus statement discusses in detail the possible mechanisms for thromboembolism in these patients and the recommended treatment.²

A surgical interventional decision was initially thought to prevent recurrent embolization. Cardiac MRI findings were most consistent with a tumour and not a thrombus and given its anatomic distribution, a left atrial myxoma was highly likely (Table 1). Multiple imaging societies have summarized their guidelines on how to safely perform cardiac imaging tests amidst the current COVID-19 crisis.^{1,9–11} Our case report demonstrates how multimodality cardiac imaging can be safely taken into consideration in specific urgent scenarios in patients with COVID-19. The appropriate choice of imaging modality can greatly influence the management of these patients.

Conclusion

Primary cardiac tumours are rare. While a high index of suspicion for thrombus should be maintained in patients with COVID-19, a multimodality imaging approach is essential to make an accurate diagnosis and appropriately guide management.

Lead author biography



Pragma Ranjan, MD, is a non-invasive cardiologist with expertise in advanced cardiac imaging including Cardiac MRI, Echocardiography, and Cardiac CT. She recently graduated from the Icahn School of Medicine at Mount Sinai in New York and is now working at the Westchester Medical Center, New York Medical College.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidelines.

Conflict of interest: None declared.

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References

- Kirkpatrick JN, Mitchell C, Taub C, Kort S, Hung J, Swaminathan M. ASE statement on protection of patients and echocardiography service providers during the 2019 novel coronavirus outbreak. *J Am Coll Cardiol* 2020;**23**:3078–3084.
- Bikdeli B, Madhavan MV, Jimenez D, Chuich T, Dreyfus I, Driggin E et al. COVID-19 and thrombotic or thromboembolic disease: implications for prevention, antithrombotic therapy, and follow-up. *J Am Coll Cardiol* 2020;**75**:2950–2973.
- Reynen K. Frequency of primary tumors of the heart. *Am J Cardiol* 1996;**77**:107.
- McAllister HA Jr. Primary tumors and cysts of the heart and pericardium. *Curr Probl Cardiol* 1979;**4**:1–51.
- Gaasch WH, Vander Salm TJ. Cardiac tumors. In: S Shah, SB Yeon (eds.), *UpToDate*. Waltham, MA, 2020. https://www.uptodate.com.eresources.mssm.edu/contents/cardiac-tumors?search=cardiac%20tumors&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1.
- El Sabbagh A, Al-Hijji MA, Thaden JJ, Pislaru SV, Pislaru C, Pellikka PA et al. Cardiac myxoma: the great mimicker. *JACC Cardiovasc Imaging* 2017;**10**:203–206.
- Klok FA, Kruijff MJHA, van der Meer NJM, Arbous MS, Gommers D, Kant KM et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thromb Res* 2020. doi:10.1016/j.thromres.2020.04.013.
- Motwani M, Kidambi A, Herzog BA, Uddin A, Greenwood JP, Plein S. MR imaging of cardiac tumors and masses: a review of methods and clinical applications. *Radiology* 2013;**268**:26–43.
- Choi AD, Abbara S, Branch KR, Feuchtner GM, Ghoshhajra B, Nieman K et al. Society of cardiovascular computed tomography guidance for use of cardiac computed tomography amidst the COVID-19 pandemic endorsed by the American College of Cardiology. *J Cardiovasc Comput Tomogr* 2020;**14**:101–104.
- Skali, Hicham, Murthy, Venkatesh, Al-Mallah L, Mouaz, H, et al. Guidance and best practices for nuclear cardiology laboratories during the coronavirus disease 2019 (COVID-19) pandemic: an information statement from ASNC and SNMMI. 2020. <https://zenodo.org/record/3738020#.Xq73JznTVP>.
- Han Y, Chen T, Bryant J, Bucciarelli-Ducci C, Dyke C, Elliott MD et al. Society for cardiovascular magnetic resonance (SCMR) guidance for the practice of cardiovascular magnetic resonance during the COVID-19 pandemic. *J Cardiovasc Magn Reson* 2020;**22**:26.