



Pathology/Biology Section - 2015

H92 Implications of Postmortem Magnetic Resonance Imaging in Sudden Cardiac Death

Marco Di Paolo, via Roma 55, Pisa 56100, ITALY; Tommaso Guerrini, Via Roma 55, Pisa 56100, ITALY; Stefania Fornaro, MD, Via Roma 55, Pisa 56100, ITALY; Laura Roas, MD, via Roma 55, Pisa 56100, ITALY; Benedetta Guidi, MD, Via Santa Dorotea 1, Pescia, Pistoia 51017, ITALY; Giovanni Donato Aquaro, MD, Fondazione Monasterio CNR-TOSCANA, Via Moruzzi, 1, Pisa 56100, ITALY; and Ranieri Domenici, MD, University of Pisa, via Roma, Pisa 56100, ITALY*

After attending this presentation, attendees will understand the importance of the execution of a postmortem cardiac Magnetic Resonance Imaging (MRI) for the detection of cardiac alterations and as a guide for histological collection in the early stage of Arrhythmogenic Right Ventricular Cardiomyopathy/Dysplasia (ARVC/D).

This presentation will impact the forensic science community by showing that the interpretation of postmortem radiology, especially in the cardiovascular field, can help the examiner in performing the autopsy.

ARVC/D is characterized by fibro-fatty replacement of the Right Ventricular (RV) myocardium and by ventricular arrhythmias as the main clinical manifestation. It represents an important cause of sudden death in young people. A genetic inheritance can be demonstrated in at least 40%-50% of the cases.

A case of a fatal arrhythmia that occurred at home in a 25-year-old man due to an early phase of ARVC/D is reported. An autopsy was carried out in order to determine the cause of death. The execution of a cardiac MRI — performed before the examination of the heart — was crucial to point out two areas of fatty infiltration not evidenced macroscopically. Histological examination of the specimens collected under the guidance of imaging was suggestive for typical alterations of ARVC/D whereas no signs of infiltration were observed in other cardiac specimens.

Case Report: A 25-year-old male student suddenly collapsed in his apartment before sleeping at night. The event was witnessed by his girlfriend. Cardiopulmonary resuscitation initiated in a few minutes by an emergency physician was unsuccessful. The family denied any previous pathology. Family history was negative for sudden death or cardiomyopathy. A complete postmortem examination was performed 24 hours after death. External examination was insignificant. At internal examination, the pericardium was opened anteriorly revealing the enclosed heart. The great arteries were transected 3cm above the aortic and pulmonary valves, the pulmonary veins and the superior and inferior vena cava, and the heart was removed. It was normal in size and weighed 360g. Other organs were unremarkable. Blood and a full-thickness block of myocardium were retained (frozen) pending onward referral for genetic testing. After routine autopsy, the heart was suspended and fixated at room temperature with 10% buffered formaldehyde solution. After 24 hours of fixation, a cardiac MRI was performed using a 1.5T clinical scanner using a brain bird-cage multichannel coil. MRI protocol included a whole heart 3D-SSFP acquisition with the following parameters: slice thickness 1mm (interpolated to 0.5mm), NEX 1, FOV 19cm, matrix 512x512, 60° flip angle, TR/TE equal to 8.4/4.1. FSE images with the following parameters were also acquired: slice thickness 2mm, NEX 1, FOV 32cm, matrix 256x256, 90° flip angle, TR/TE equal to 840/8.1. In 3D-SSFP images, two focal areas of suspected fat infiltration were detected in the sub-tricuspidal region and in the lateral free-wall. These regions with suspected fat infiltration were also evidenced in FSE images. The heart underwent macroscopic examination: coronary vessels and main branches, examined by multiple cross sections, were normal; no atherosclerotic lesions were detected; RV wall thickness was 0.4cm. The investigation of the two areas clearly highlighted by MRI revealed small foci of fat infiltration without clear pathological significance. Full-thickness blocks of myocardium were removed for histological examination from anterior, lateral, and posterior left ventricular free wall, from ventricular septum, from RV outflow tract, and from both atria, according to the recommended guidelines for best practice. Furthermore, other samples were obtained directly from the areas indicated by the MRI (as being suggestive for fat infiltration). Specimens were embedded in paraffin and routinely processed.

The histological examination of “MRI guided” cardiac specimens, stained with haematoxylin-eosin and Masson, revealed fibrous and fatty tissue replacement that had swept inwards from the epicardial aspect to the endocardial aspect of the ventricle chamber. Myocardial disarray, lymphocytic infiltrates, and foci of contraction band necrosis were also observed. No remarkable alterations were detected in all other cardiac specimens. Postmortem toxicological analyses were negative for alcohol, drugs, and common toxicants. The cause of death was attributed to ARVC/D.

Sudden Death, Histopathology, Cardiac MRI

Copyright 2015 by the AAFS. Unless stated otherwise, noncommercial *photocopying* of editorial published in this periodical is permitted by AAFS. Permission to reprint, publish, or otherwise reproduce such material in any form other than photocopying must be obtained by AAFS.