H110 Bifid Cardiac Apex and Sudden Death: An Unusual Case and Review of the Literature

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After attending this presentation, attendees will better understand bifid cardiac apex, which is a very rare morphologic finding in humans and is generally associated with other cardiac anomalies. The goal of this presentation is to contribute additional information regarding the occurrence of this anomaly and its association with other cardiac defects (i.e., Atrial Septal Defect (ASD), multiple Ventricular Septal Defects (VSDs), persistent left superior vena cava, high take-off Right Coronary Artery (RCA)). If one of these diagnoses is made, the pathologist should be prompted to carefully examine the remainder of the heart for other defects.

This presentation will impact the forensic science community by highlighting the essential role of autopsy and histological analysis in order to better understand the cause of sudden cardiac death and be able to identify rare and hidden anatomic anomalies.

Bifid cardiac apex is rarely seen in normal human hearts or in association with congenital heart defects.[1] This malformation has been described in several adult marine mammals, such as the sperm whale (*Physeter macrocephalus*) and manatee (Order: Sirenia); therefore, it is not clear whether the bifid apex is the rule or the exception.[2] In humans, the bifid cardiac apex is normally present during embryonic development prior to completion of ventricular septation.[3] The notch between the two ventricles disappears by the 11th week of gestation, and its postnatal persistence is likely the precursor to a bifid cardiac apex.[4]

This study presents a remarkable case of bifid cardiac apex that was an incidental finding in an 11-year-old boy with sudden unexpected death, followed by review of the literature. The past clinical history of the child was characterized by a diagnosis, at birth, of the atrial septum in the fossa ovalis that underwent spontaneous closure at just over some months of age. Postmortem examination was requested by the emergency department physician and an autopsy was performed ~24h after death. Interestingly the heart (270g) revealed a bifid cardiac apex with a 1.7cm long cleft. All four cardiac valves appeared unremarkable, with no thrombi or vegetation. The fossa ovalis was closed. The coronary arteries presented a high take-off of the right coronary artery (5mm above the sinotubular junction) with a slit-like orifice. Histologically scattered foci of myopericarditis (CD3+) were observed. The chemical analysis report did not detect any toxicological substances. Based on postmortem findings and histopathological report, the final cause of sudden death was opined as fatal arrhythmia in a heart with bifid apex and right coronary high take-off.

With regard to bifid cardiac apex, a review of the literature was conducted and this unique morphologic anomaly has been described previously in eight cases. The characteristics and prognosis of patients, the method used for the diagnosis of bifid apex, and the associated congenital heart diseases have been identified.

In conclusion, through this case and a review of the literature, it is confirmed that the bifid heart is not directly responsible for sudden cardiac death; however, this study identifies the first association between bifid cardiac apex and high take off of right coronary artery.

Reference(s):

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4. Teja K., Sturgill B.C. Bifid cardiac apex. *Am Heart J*. 1986;111:1004–5.

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