

# Sudden death due to single coronary artery

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## ABSTRACT

**Coronary artery anomalies that entail a risk of sudden death are frequently associated with complex cardiac malformations but may occasionally be solitary. A 31-year-old man became ill in the night and lost consciousness. He was taken to a hospital where he was treated. However, he died on the same day. The death was considered to be suspicious and an autopsy was mandated. On macroscopic examination, the heart weighed 410 g. A single coronary artery that originated from the right aortic sinus was found. The coronary artery ostium was 0.8 cm in diameter and had a hole-like shape. Demonstration of coronary artery pathologies in autopsies is vital for the elucidation of sudden death cases related to these lesions and for the development of new treatment approaches. The aims of this case report are to contribute to a better understanding of the coronary artery anomalies and emphasise their medicolegal importance.**

**Keywords: autopsy, coronary artery, single coronary artery, sudden death**

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## INTRODUCTION

Coronary artery anomalies that entail a risk of sudden death are frequently associated with complex cardiac malformations but may occasionally be solitary.<sup>(1)</sup> In some series, the right coronary artery is the commonest anomalous vessel,<sup>(2)</sup> and the first antemortem diagnosis of a single coronary artery was made by means of coronary angiography.<sup>(3)</sup> The prognosis of individuals with this finding is unclear. Authors report that the presence of a single coronary artery has no impact on life, but there is evidence that these patients have a high incidence of sudden death.<sup>(4,5)</sup> Single coronary artery is a rare congenital anomaly of the coronary arteries where only one coronary artery arises from the aortic trunk by a single coronary ostium<sup>(6,7)</sup> and occurs in approximately 0.02%–0.07% of the population.<sup>(7,8)</sup> Demonstration of coronary artery pathologies in autopsies

is vital for the elucidation of sudden death cases related to these lesions and for the development of new treatment approaches. The aims of this case report are to contribute to a better understanding of the coronary artery anomalies and emphasise their medicolegal importance.

## CASE REPORT

According to the death document, the patient, a 31-year-old man, became ill in the night and lost consciousness. He was taken to a hospital where he was treated. However, he died on the same night. The death was considered to be suspicious and an autopsy was mandated. His family members stated that he had been treated for his cardiac problem in a military hospital, where it was explained that the patient had heart murmurs and atypical chest pain without atherosclerotic heart disease, which did not represent a serious disease of the heart and vascular system, and should not be treated. An angiogram was not done, only analgesics were administered, and coronary bypass surgery was not offered to the patient.

At postmortem, the 31-year-old cadaver was 171 cm tall and weighed 75 kg. On inspection, there were defibrillator marks on the thoracic wall and four needle puncture sites on the median side of the left nipple. Macroscopical examination of both lungs revealed subpleural superficial bleeding between the lobes. Histopathological examination showed oedema and congestion. The pericardium appeared normal. The heart weighed 410 g. (Fig. 1). There were needle punctures on the right ventricle epicardium, and the aortic arch and valves appeared normal. A single coronary artery originated from the right aortic sinus (Fig. 2). The coronary artery passed tangentially between the aorta and the pulmonary artery, the ostium was the hole-shaped, and the orifice was 0.8 cm in diameter. The single right coronary artery branched in the left anterior descending artery, and left circumflex coronary artery separately, from the proximal part of the normal right coronary artery, 1 cm from the ostium.

The present case was classified as a R-III-B subtype single coronary artery. The coronary artery investigation revealed luminal dilatation. There were tiny capillary vessels on endocardium of the left ventricular septum on macroscopical examination. The heart, as well as

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**Fig. 1** Specimen photograph shows the macroscopical appearance of the heart.



**Fig. 2** Specimen photograph shows a single coronary artery originating from the right sinus aorticus.

the cardiac conduction system, depended exclusively on the single coronary artery for oxygenated blood supply, and the unbalanced blood distribution led to sudden cardiac death. Analysis of the organ specimens revealed none of the substances screened for in systematic toxicological methods.

## DISCUSSION

Coronary artery anomalies that entail a risk of sudden death are frequently associated with complex cardiac malformations but may occasionally be solitary.<sup>(1)</sup> In some series, the right coronary artery, the commonest anomalous vessel was involved in 48.7% of the patients.<sup>(2)</sup> Single coronary artery is a rare congenital anomaly of the coronary arteries where only one coronary artery arises from the aortic trunk by a single coronary ostium<sup>(6,7)</sup> and occurs in approximately 0.02%–0.07%<sup>(7,8)</sup> of the population. The persistent truncus arteriosus<sup>(9)</sup> and pulmonary atresia<sup>(10)</sup> are

the other congenital anomalies in association with a single coronary artery. The present case was classified as a R-III-B subtype single coronary artery according to previous studies.<sup>(5,7)</sup>

Taylor et al stated that high risk anatomy involved abnormalities of the initial coronary artery segment or coursing of the anomalous artery between the pulmonary artery and aorta.<sup>(4)</sup> The first antemortem diagnosis of a single coronary artery was made by means of coronary angiography.<sup>(3)</sup> Based on angiographical analysis, a classification was proposed, according to the site of origin and anatomical distribution of the branches by Lipton et al.<sup>(7)</sup> Mavi et al<sup>(6)</sup> discussed the classification system of Yamanaka and Hobbs,<sup>(5)</sup> who modified the Lipton et al<sup>(7)</sup> classification grouped as I, II, III, designated with “R” or “L”, depending upon whether the ostium is located in the right or left sinus of Valsalva, and also described with the letters “A”, “B” and “P”, for “anterior”, “between”, and “posterior” patterns of the single coronary artery. This referred to the relationship between the anomalous coronary artery and the aorta and pulmonary artery. “Septal” (S) and “combined” (C) types, were added by Yamanaka and Hobbs<sup>(5)</sup> in order to describe the anatomical variations more precisely.<sup>(6)</sup>

In the literature, rare reports attribute myocardial ischaemia to the coronary anomaly itself.<sup>(10)</sup> Mavi et al presented a case of a 57-year-old woman with atypical chest pain, in whom coronary angiography showed a L-I subtype single coronary artery (arising from a single ostium in the left sinus of Valsalva) without associated cardiovascular disease.<sup>(6)</sup> Yamanaka and Hobbs stated that most coronary anomalies did not result in signs, symptoms or complications, and usually were discovered as incidental findings at the time of catheterisation.<sup>(5)</sup> Younger patients ( $\leq 30$  years old) were reported significantly more likely than older patients to die suddenly or during exercise, despite their low frequency of significant atherosclerotic coronary artery disease.<sup>(4)</sup> On the other hand, Garg et al stated that atherosclerotic plaques in the anomalous arteries were seen in only 33% of the patients, much less than the overall incidence of coronary artery disease in patients with congenital coronary anomalies.<sup>(2)</sup> In this series, only the anomalous vessels in four patients were involved in coronary artery disease. Thus, in a small subgroup, there does not appear to be an increased risk for the development of atherosclerotic coronary artery disease in anomalous coronary arteries.

Different treatment approaches were reported in related cases. The operative management of the patient with a single right coronary artery with disabling angina without concomitant arteriosclerotic involvement was an aorta-anterior descending saphenous vein bypass

graft.<sup>(11)</sup> In addition, Kaza et al described a surgical ostial remodelling method in a patient with a narrowed proximal portion left coronary artery originating at the single right coronary ostium.<sup>(12)</sup> The presence of a single coronary artery is an uncommon finding. When both ostia cannot be identified, it is a rare cause of atypical chest pain, myocardial ischaemia, congestive heart failure and sudden death. Demonstration of coronary artery pathologies in autopsies is vital for the elucidation of sudden death cases related to these lesions and for the development of new treatment approaches. Performing autopsies for a better understanding of the coronary artery anomalies associated with sudden death is also important for the medicolegal resolution of the cases.

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