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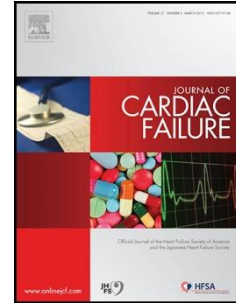
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**Did Frédéric Chopin die from heart failure?****Perciaccante A.**<sup>1</sup>, **Charlier P.**<sup>2,3</sup>, **Negri C.**<sup>1</sup>, **Coralli A.**<sup>4</sup>, **Appenzeller O.**<sup>5,6</sup>, **Bianucci R.**<sup>7-9</sup><sup>1</sup> Department of Medicine, “San Giovanni di Dio” Hospital, Gorizia, Italy<sup>2</sup> Section of Medical and Forensic Anthropology (UVSQ & Paris 5 University EA 4569), Montigny-Le-Bretonneux, France.<sup>3</sup> CASH & IPES, Nanterre, France<sup>4</sup> Azienda per l’Assistenza Sanitaria n. 2, Bassa Friulana-Isontina, Gorizia, Italy<sup>5</sup> New Mexico Health Enhancement and Marathon Clinics research Foundation, Albuquerque, NM, USA<sup>6</sup> New Mexico Museum of Natural History and Sciences, Albuquerque, NM, USA<sup>7</sup> Department of Public Health and Pediatric Sciences, Legal Medicine Section, University of Turin, Italy.<sup>8</sup> UMR 7268, Laboratoire d’Anthropologie bio-culturelle, Droit, Etique & Santé (Adés), Faculté de Médecine de Marseille, France<sup>9</sup> Warwick Medical School, Microbiology and Infection Division, University of Warwick, United Kingdom**Corresponding author:**

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### Abstract

On October 17, 1849, Poland's greatest composer, Frédéric Chopin (1810-1849) died aged 39. His cause of death remains unknown. An investigation of the documental sources was performed to reconstruct the medical history of the artist. Since his earliest years, his life had been dominated by poor health. Recurrent episodes of cough, fever, headaches, lymphadenopathy- a series of symptoms that may be attributed to viral respiratory infections- manifested in his teens. Later in life, he had chest pain, hemoptysis, hematemesis, neuralgia, and arthralgia. Exhaustion and breathlessness characterized all his adult life. Coughing, choking, and edema of the legs and ankles manifested four months before his death. Several hypotheses ranging from cystic fibrosis to alpha-1 anti-trypsin deficiency and pulmonary tuberculosis have been proposed to explain Chopin's lifelong illness. We suggest that Chopin had dilated cardiomyopathy with consequent heart failure and cirrhosis that caused his death.

Keywords: heart failure, dilated cardiomyopathy, Chopin

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The life of Poland's piano virtuoso and composer Frédéric Chopin (1810-1849) was dominated by poor health but the cause of his life-long illness remains unknown. He died in Paris on October 17, 1849 aged 39. Dr Jean Cruveilhier (1791-1874), a prominent French physician and expert in tuberculosis, anatomy, and pathology assisted Chopin until his death; he wrote Chopin's death certificate attributing his demise to tuberculosis of the lungs and the larynx. Casts of Chopin's face and hands were taken the day after his death and the body was autopsied. The autopsy report was never found. However, based on indirect evidence- a letter addressed by Jane Stirling to Franz Liszt, it appears that, at autopsy, Dr. Cruveilhier could not confirm pulmonary tuberculosis as the cause of Chopin's death: *the autopsy did not disclose the cause of death, nevertheless he could not have survived*. No clear evidence of pulmonary tuberculosis (*...the lungs were affected less than the heart ... no pulmonary consumption*) was found. However, Dr Cruveilhier found evidence of an *enlarged heart, ...diverse pathology..., a disease never encountered before* (1).

Several hypotheses ranging from cystic fibrosis (2) to alpha-1 anti-trypsin deficiency (3) and pulmonary tuberculosis (4) have been proposed to explain Chopin's life-long illness. Although cystic fibrosis is consistent with the respiratory symptoms and severe diarrhea, long survival to the age of 39 in the pre-antibiotic era is unusual.

Prior to death, when Chopin was visited by his sister Ludwika, he told her that he wanted his heart to be taken to Warsaw after his death, and that Mozart's Requiem in D minor should be played at his funeral (5). Chopin, who suffered from taphephobia, told to his sister: *"Swear to make them cut me open, so that I won't be buried alive"* (5). After the autopsy, the heart was removed. While the body was inhumed at Père Lachaise Cemetery (Paris), his heart was sealed in a jar of brandy or cognac and was taken back to Warsaw by Ludwicka.

In April 2014, an investigation of his heart's preservation was carried out in Warsaw (4). Witt et al (4) report that the heart was found to be massively dilated in size and floppy. The authors proposed that tuberculous pericarditis with enlargement of the right ventricle, due to pulmonary hypertension, was probably the cause of death (4), but we expressed skepticism (6). The size of the ventricles (the

atria were destroyed during the autopsy in 1838) and the thickness of the right and left ventricular walls were not measured (6). The published images of Chopin's heart show left and right ventricular enlargement, a condition that allows other interpretations (6).

We reconstructed, through Chopin's biographies and perusal of his correspondence, the medical history of the artist. Signs and symptoms of the disease(s) that affected him since his teens were collected (Table 1) and interpreted in light of modern medical knowledge.

We propose that Chopin had dilated cardiomyopathy with consequent heart failure and cardiac cirrhosis (congestive hepatopathy). The chronic breathlessness and easy exhaustion in his last years may have been symptoms of left heart failure. From 1848 onward, Chopin's cardiac function progressively worsened. Signs of congestive heart failure, such as edema of the legs and ankles were recorded in the last four months of his life. Furthermore, he had several episodes of hematemesis, which can be expressions of cardiac cirrhosis. Since early 1849, he also had pains in the wrists, hands, and ankles. The cast of his left hand indicates the presence of slight nail clubbing, which is more evident on the thumb, and which is consistent with chronic pulmonary insufficiency. At the time of Chopin's death, the relationship between heart diseases and heart failure had not been fully clarified. Significant progresses in cardiology and, more specifically, in the understanding of heart failure pathophysiology, were made during the first half of the 19th century.

Cardiac hypertrophy, cardiac enlargement, valvular heart disease and ischemic heart disease were finally recognized as underlying causes of heart failure. Indeed, in 1831, in his *Treatise on the Diseases of the Heart and Great Vessels*, James Hope (1801-1841) described the classic signs and symptoms of heart failure. Hope's descriptions of fluid retention and development of ventricular hypertrophy and dilatation enhanced the understanding of heart failure and the mechanism by which edema is formed establishing the concept of "backward heart failure." Hope stated that: *The overworked ventricle first hypertrophies and then dilates. As it dilates the blood gets dammed up behind it and an increased venous pressure is transmitted ultimately to the capillaries where the*

*edema is formed* (7). We doubt that Dr. Cruveilhier was aware of these new findings at the time he assisted Chopin and autopsied his body.

Based on the available biographical data, the etiology of Chopin's dilated cardiomyopathy could have been either inflammatory or idiopathic, or familial; no further speculations on its exact nature can be performed. Our initial hypothesis is indirectly confirmed by the absence of evidence of tubercular lesions in the lungs, and by statements from Chopin's closest friends suggesting that the physical conditions of the artist was chronic and not the result of a newly contracted disease (3,8).

Since the Polish Ministry of Culture (2008) has not granted permission to carry out invasive investigations on the artist's heart, the precise cause of death may remain unknown.

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Table 1- The medical history of the Chopin is summarized below.

Dates	Place	Symptoms	References
During his teens	Poland	respiratory symptoms, recurrent diarrhea, and weight loss	8
1826	Poland	exacerbation of his symptoms: respiratory complaints, headaches, and cervical adenopathy	9
1830	Wien	Relapse of respiratory symptoms, headache and cervical adenopathy	8
1831	Paris	Chest pain, hemoptysis, headache, and fever with hallucination	8,10
1835	Paris	Bronchitis and laryngitis	3
1837	Paris	Fever and associated hallucinations, hemoptysis, hematemesis	10
1837	Paris	-Chopin is constantly breathless and exhausted	3
		-His physician, Dr. Gaubert, excluded that he had pulmonary tuberculosis and suggested as a treatment that he move to a milder climate	3
		- Chopin and his friend George Sand along with her children left Paris for Majorca. There, he continued to be ill for weeks having also episodes of severe diarrhea that were attributed to an intolerance to fatty foods	11
1838-1839	Majorca	While in Majorca, he was visited by three local physicians. Although they were unable to diagnose his illness, they claimed that it was lethal	11

winter of 1838-39	Majorca	Chopin and George Sand moved to Valldemossa Monastery where they spent the winter.  At the monastery, he had fever, weakness and nightmares/hallucinations	11  11
1840	Marseilles	his health declined further. Pale and thin, he was feeling constantly exhausted	3
Winter 1843	Paris	Chopin was ill with cough and two major exacerbations accompanied by neuralgia	11
Winter 1847	Paris	- Chopin was ill again and had several further relapses.  - the end of his relationship with George Sand and dramatic worsening of his health	11
1848	London, Edimburgh	- he was frequently confined to bed  - he was unable to leave the house due to a cold accompanied by headaches, neuralgia, and by his constant cough and a sense of suffocation	3  9
1849	Paris	- his disease progressed rapidly  - He was confined to bed and hardly spoke. He had pains in the wrists, hands, and ankles.  - on the night of 21st June, he had two gastrointestinal hemorrhages, edema of the legs and ankles and became lethargic	3  3  3

		<p>- At the end of June, although afebrile, he had edema of the lower limbs accompanied by a constant sense of exhaustion and suffocation</p> <p>-Chopin consulted Dr. Cruveilhier a prominent French physician and expert in tuberculosis, anatomy, and pathology.</p> <p>- On the night of Oct 12th, he had severe cramps. His agony lasted four days accompanied by a constant cough. During this time he was always conscious.</p> <p>- On the evening of Oct 15th, he suddenly became hoarse, and lost consciousness several times., He had convulsions and was in severe pain and choking with a cough</p> <p>- Around eleven PM, his face darkened and in a barely perceptible voice, he said that he felt no more pain and slept until Oct 17th 2 AM when he briefly woke up covered by a cold sweat and died.</p>	<p>3</p> <p>12</p> <p>3</p> <p>3</p> <p>3</p>
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