



## A minimal tour towards the history of the myocardial infarction

### Breve recorrido por la historia del infarto del miocardio

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#### Palabras clave:

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#### ABSTRACT

Myocardial infarction is one of the significant causes of death in the urban population since the second half of the past century. The current paper describes the discoveries and thinkings concerning coronary disease, from ancient times towards the twentieth century.

#### RESUMEN

El infarto del miocardio es una de las causas importantes de muerte en la población urbana desde la segunda mitad del siglo pasado. El presente artículo describe los descubrimientos y pensamientos sobre la enfermedad coronaria, desde la antigüedad hasta el siglo XX.

#### INTRODUCTION

Myocardial infarction is one of the significant causes of death in the urban population since the second half of the last century; however, the clinical description has not changed; it is worth referring the narration of Dr. Ignacio Alvarado, who personally attended the Mexican President, Benito Juárez in his last moments:

«Two hours ago, I had hardly been at his side when the oppression of the heart with which he began transformed into very sharp and sudden pains, those that I saw, those that I guessed in the pallor of his countenance. That man must be suffering the mortal anguish of the one who looks for air to breathe and cannot find it; from the one who feels that the ground on which he leans runs away and fears to fall; from which, in short, he is simultaneously proving what it is to die and continue living. The disease progresses to successive attacks while standing up, then he reclines to avoid collapse, instinctively searching for the blood that he so badly needs into his brain.

Each paroxysm lasts for a variable time, then gradually fades away, then the color returns to its countenance and enters a complete calm;

the patient gets up and talks with those of us around him who are indifferent, in all naturalness and without hinting at his sufferings; and it seems that he is already saved, when a new attack returns, and a new relief, and in these alternatives four or five long hours elapse, in which a thousand times we have believed to sing a victory or mourn a death.

It was eleven o'clock in the morning of that mournful day, July 18, when a new, excruciating cramp in his heart forced him to throw himself quickly to the bed; his pulse was no longer moving, his heart was beating weakly; his countenance fell, covering himself with the precursor shadows of death, and in the supreme event I had to go, against my will, to apply a very cruel, but effective remedy: boiling water over the region of the heart...».<sup>1</sup>

The first graphic description of an event of sudden cardiac death corresponds to Horemkemes I (1050 BC), Priest of Ammon, and foreman pyramids construction manager of the Thebes XX Dynasty.<sup>2</sup> Leonardo da Vinci performed the first necropsy after death from coronary origin, in 1506.<sup>3</sup>

The discovery and reading of the Ebers papyrus make manifest the Egyptians' knowledge about heart disease. This papyrus dates back

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more than 1500 years BC, and it is an ancient medical treatise that has, of course, the description and treatment of heart diseases, including coronary heart disease; these include classic symptoms such as chest pain or heaviness and collapse, expressing the nearness of death when a person has a heart condition and has pain in the arms, chest, and side of the heart.<sup>4</sup>

Hippocrates and his followers, between the 5th and 4th centuries BC, related, on a theoretical basis, symptoms such as cooling, blindness, seizures, and loss of speech, with stasis in the blood vessels. The Bible and the Talmud talk about cardiac death, apart from their poetic allusions to the heart.<sup>5</sup>

William Heberden, in 1768, made a fascinating description of his observations in about one hundred of his patients with angina pectoris and sudden death. The narrative is very detailed and includes the characteristics of chest pain in different locations and irradiations, sometimes with paresthesia in the hands; it also states that the pain can appear during the march, mainly uphill but that the movement of a horse or carriage or even swallowing, coughing, defecating or any mental disorder may trigger it. He also mentions that sometimes the subject can wake up with dyspnea and feel compelled to sit down to achieve some improvement and that sometimes he found alterations in the pulse of some of his patients.

Among those almost 100 patients, only three were women and a twelve-year-old boy; the rest were men over fifty years old. It is exciting the description of one of his patients who died suddenly, in whom he opened the chest to find a heart without apparent alterations. Dr. Heberden also clarifies that he could not make any new contribution to the remedies proposed in the classical writings; however, he explains how spirits and opium can control symptoms; it also narrates the case of one of his patients who was cured after sawing wood for half an hour daily and another who obtained spontaneous healing.<sup>6</sup>

A short time later, between 1786 and 1799, Edward Jenner and Caleb Hillier Parry, who were close friends, first described the relationship between angina and cardiac death with coronary sclerosis found in several of their patients. The surgeon John Hunter confirmed this description and wrote Jenner about his

paroxysms of chest pain, with the mention that his life was in the hands of any rogue who chose to disturb him; finally, he died suddenly during a discussion in the hospital; his autopsy showed coronary ossification and white plaques inside the left atrium and left ventricle.<sup>7</sup>

One of the first evidence connecting sudden death with the heart and coronary atherosclerosis results from the dramatic end of Bertel Thorvaldsen in 1844; he was a famous Danish sculptor who died in his seat while witnessing the execution of the first movement of Ferdinand Ries's sixth symphony at the Royal Danish Theater. Thorvaldsen's death generated a great dispute between two of the doctors attending him because one of them had performed a bilateral tibial fontanel to cure weakness in both legs. This fontanelle consists of a surgical wound so that the fluids that cause discomfort in the limbs can drain there; it is not clear in the narratives if this problem was due to edema or intermittent claudication, but there was a strong media reaction towards one of the doctors accused of causing the artist's death because he had closed one of the fontanelles.

The sculptor's autopsy clearly describes that the left coronary contained within it numerous plaques of atheroma from one inch of its origin to its bifurcation, that one of those plaques was severely ulcerated and that the atheromatous mass had escaped into the lumen of the artery; this constitutes the first finding of a broken plaque in a person with sudden death.<sup>8</sup>

Rudolf Ludwing Karl Virchow, in 1848, coined the terms «thrombosis» and «embolus» with the meaning we use today. He was a doctor who admirably covered his profession, as an excellent student, teacher of medical legends who would later produce famous publications in various areas, researcher and editor of his magazine and also a significant committed to society and constant annoyance for the German government - refused a duel to the death to the Iron Chancellor, Otto von Bismarck, Otto von Bismarck-. In the same year, he described his famous triad of vascular lumen irregularity, damaged blood flow, and increased coagulability.<sup>9</sup>

Virchow's work in the vascular area was continued and crowned by his extraordinary student Julius Cohnheim, who injected wax emboli into the frog's tongue and demon-

strated the lesions that a hundred years later would be called ischemic necrosis and hemorrhagic infarction.<sup>10</sup>

In the second half of the 19th century, Thomas Lauder Brunton identified effects similar to those observed for centuries with therapeutic bleeding in amyl nitrite, and in 1879, Alfred Murrel used nitroglycerin to mitigate angina pectoris. Nitroglycerin was a homeopathic drug that was first used by Constantine Hering in 1840.<sup>11</sup>

There is a direct line of research from Virchow; Cohnheim, Carl Wiger, Karl Huber and William Osler, published several experiments and observations about the correlation between coronary occlusion and myocardial infarction and angina<sup>12</sup> and soon after, in 1899, Walter Baumgarten and William Porter published their experimental observations of loss of myocardial contractility after coronary occlusion and contractile recovery by restoring circulation with blood without fibrin; they also observed that contractile loss was more significant in the center of ischemia than in the periphery.<sup>13</sup>

John B. Herrick published in 1912 an extensive review of publications about the relationship between heart attack, angina, and coronary artery disease and managed to establish that thrombotic occlusion of the coronary vessels can be fatal but not always. Using his findings, he differentiates between infarction and ischemia, describes the variability of the clinical presentation of the syndrome and explains this variability to extra coronary factors such as blood pressure, previous myocardial status, and aspects of coronary occlusion such as vessel size, location of the occlusion and number of vessels injured. This valuable Herrick publication was the result of reading a previous work published in German by two Russian doctors, Obrastzov and Straschesko.<sup>14</sup>

There was a long delay between Heberden's work and the clinical identification of myocardial infarction until the beginning of the 20th century, with Herrick. These delays had several causes, among them, the belief of the absolute unviability of the coronary occlusion, the significant inconsistency between the symptoms and the pathological findings, the confidence of nineteenth-century doctors in auscultation, the lack of revision of the coronary arteries and

the myocardium at autopsy, the gap between pathological and physiological findings and their incorporation into medical practice, the preponderance towards bacteriological research and the lack of diagnostic tools.<sup>15</sup>

After the invention of the electrocardiogram, by Willem Einthoven, it was a resource used for the recognition of arrhythmias that was not very useful because there were no monitors to monitor patients. Still, it was the same Herrick who, together with his assistant, Fred Smith, described electrocardiographic changes during the experimental coronary occlusion. Concepts that in 1932 Charles Wolferth and Francis Wood enriched with the precordial leads.<sup>16</sup>

The treatment of the heart attack did not change much for hundreds of years because there was no efficient therapy that modified the evolution of the patients until the sixties of the last century, confined to absolute bed rest with assisted feeding for a month and a half. Such that survivors faced the risk of apparent complications from prolonged bed stay, particularly infections and thrombus embolism.

The knowledge of ventricular fibrillation is a critical aspect of the care of myocardial infarction well as its diagnosis and treatment. The Ebers papyri recognized ventricular fibrillation, saying that when the heart is sick, it performs its work imperfectly, and the vessels that come from it becomes inactive and unfelt. If the heart trembles, it has little energy and sinks, the disease is advanced, and death is near. Hippocrates also described sudden death for the first time when he said that subjects who suffered frequent and severe fainting without apparent cause died suddenly.<sup>17</sup>

The classic descriptions of ventricular fibrillation were published long before the invention of the electrocardiogram, from Vesalius's appreciation that the hearts of dying animals exhibited worm movements. The same with the experimental achievement of ventricular fibrillation in the work of Carl Ludwig and Hoffa, until the first proposal of this phenomenon as a mechanism of sudden death, by John Mac William, ending the belief that the cause was sudden cardiac arrest in diastole. This publication also changed the name of heart failure to sudden death.<sup>18</sup>

General Electric sponsored research, at various Universities, after several electrocu-

tion accidents due to the change from direct to alternating current, to discover the causes of the lethality of electric current. Then William Kouwenhoven and Guy Knickerbocker started the modern era of cardiopulmonary resuscitation with the implementation of electrical cardioversion and the cardiac massage, later Claud Beck performed the first successful clinical cardioversion by Claud Beck in 1947.<sup>19</sup>

For two decades after these discoveries, the development of closed-chest defibrillators arose from the publications of Bernard Lown—creator of the term cardioversion—and Barouh Berkovits and the introduction of biphasic wave equipment in the Soviet Union by Naum Gurvich, until the development of the 70 kg portable equipment in 1965. The characteristics of these devices made them of little value for clinical application because, apart from the enormous complexity for their management, patients moved for considerable distances in hospitals for reanimation.<sup>20</sup>

These considerations led to one of the crucial moments in the treatment of myocardial infarction, the creation of the coronary units; Eugene Braunwald considers the coronary care unit the essential advance in the treatment of acute myocardial infarction. The concept stems from the need to bring patients vulnerable to lethal arrhythmia together in a single area to shorten the reaction time and reduce the possibility of brain damage; likewise, it requires the training of nursing personnel in the early recognition of acute complications of heart attack and the immediate application of resuscitation maneuvers.

The initial concept of the coronary unit comes simultaneously in 1961 from the ideas of William Dock in the United States and Julian Desmond in England. Both doctors achieved little attention, and Julian had to open the first unit in Australia, but there was no acceptance of this resource in the world until after the death of Clark Gable on the tenth day of an uncomplicated heart attack, treated at the Presbyterian Hospital in Hollywood; the press provoked the reaction and the creation of the first well-equipped coronary unit in Kansas City.<sup>21</sup> In Mexico, there was a sequence for creating units for

post-surgical care, and Dr. Enrique Parás Chavero established the first coronary unit at the Spanish Hospital in 1968.<sup>22</sup>

Despite the knowledge concerning thrombosis and necrosis for more than a century, it took a long period of controversy during the second half of the twentieth century about thrombosis as cause or effect during the myocardial infarction. It was the single paper from Marcus DeWood et al,<sup>23</sup> which constitutes significant therapeutic changes: 1. It showed to the world that it is feasible the cardiac catheterization during the acute myocardial infarction in an era when it was considered lethal, 2. It confirmed the almost constant presence of coronary thrombosis, 3. It confirmed the open artery theory, with the first experience of thrombus retrieval. A significant development came later, with many trials for thrombolysis and catheter-based treatments for acute myocardial infarction. Our country had the possible first experience of primary angioplasty, included in the Spanish Hospital's initial patients' series experience.<sup>24</sup> I want to conclude with something that I commented to my professor during my early trainee as a cardiology resident about what we can expect from the future diagnostic and therapeutic approaches; he asked me to remember that we see beyond because we are over the shoulders of giants.

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