

# Empress Sissi and Cardiac Tamponade: An Historical Perspective

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On September 10, 1898, Empress Elizabeth of Austria, known as Sissi, was stabbed with a stiletto knife in her chest by an Italian anarchist in Geneva, Switzerland, and died 1 hour later. The autopsy revealed a large clot in the pericardial sac due to a perforation of the left ventricular wall, and the report concluded, "Death was undoubtedly caused by a progressive and slow blood leak, sufficient to compress the heart and to suspend its functions." Since antiquity, wounds of the heart had been considered immediately fatal, until Paré observed a delayed death after a stab to the heart in the 16th century. The physiology of cardiac tamponade was then elucidated by Richard Lower in 1669. However, it was only in the 19th century that the main clinical features of cardiac tamponade were described and the first treatments attempted. Kussmaul identified its most important clinical hallmark, *pulsus paradoxus*, in 1873 and the term "tamponade of the heart" was coined for the first time by Rose in 1884. Romero and Larrey pioneered the open drainage of the pericardium early in the century, and Rehn performed the first successful surgical suture of a heart wound in 1896. In conclusion, logistics aside, medical knowledge at the end of the 19th century would have been theoretically sufficient to save the empress from death. © 2008 Elsevier Inc. All rights reserved. (*Am J Cardiol* 2008;102:1278–1280)

From antiquity to the Renaissance, wounds of the heart were considered to be uniformly fatal. This was followed by a period of observation and experimentation that allowed the elucidation of the physiology and clinical signs of cardiac tamponade, although the first treatments were attempted only at the beginning of the 19th century. We review cardiac tamponade from a historical perspective and revisit the case of 1 of its most famous victims, Empress Sissi of Austria.

## A Delayed Death

On September 10, 1898, Elisabeth of Wittelsbach (Figure 1), empress of Austria and queen of Hungary, nicknamed Sissi, was staying incognito at the Hotel Beau-Rivage in Geneva, Switzerland. At 1:30 PM, the 60-year-old empress and her lady-in-waiting left the hotel to board the steamboat Geneva. Five minutes later, close to the landing stage, Luigi Lucheni, an Italian anarchist, rushed up to the empress and stabbed her deeply under her left breast with an 8.5-cm-long stiletto knife and then ran off. Sissi fell to the ground but was immediately helped back onto her feet without apparent consequences. No one saw the weapon, and it was deduced that Lucheni had intended to steal her watch.

At 1:40 PM, the bell of the Geneva rang to warn of its imminent departure, and the empress and her lady-in-waiting walked quickly to board. Five minutes later, on the deck of the boat, the empress turned very pale and lost consciousness. A brown stain the size of a coin showed through her bodice, and a small droplet of dried blood was found under



Figure 1. Empress Elisabeth of Austria, by Franz Xaver Winterhalter, 1865. Reproduced with permission from *Sur les pas de Sissi*.<sup>3</sup>

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her left breast. When informed of the identity of the passenger, the steamboat immediately returned to port. Still unconscious, the empress was transported to her hotel room on an improvised stretcher at 2:15 PM. A local practitioner was called immediately and tried to probe the wound, but without success. Sissi died at 2:40 PM.

The following day, a partial autopsy was undertaken to find out the exact cause of death. An excerpt of the conclusions of the report read, "The lesions described have been produced by a long instrument of triangular shape with more or less blunted edges. This instrument entered the thoracic wall with violence, breaking a rib and completely perforating the left ventricle. The general direction of the wound corresponds to a line slightly directed from top to bottom and from the outside to the inside. Death was undoubtedly caused by a progressive and slow blood leak, sufficient to compress the heart and to suspend its functions. The finding of a voluminous blood clot occupying the pericardium is the absolute proof of it."<sup>1-4</sup>

### History of Cardiac Tamponade

Knowledge of the pericardium dates back to the time of Hippocrates (circa 460 BC to 370 BC), who described it as "a smooth mantle surrounding the heart and containing a small amount of fluid resembling urine."<sup>5</sup> However, pericardial effusion was first observed by Galen only 600 years later, probably because of the ancient Greek belief that the heart was inviolate and could not be a target for disease.<sup>6</sup> As physician to the gladiators, Galen also observed many heart wounds and considered these to be immediately fatal, an opinion that remained unchallenged until the Renaissance.<sup>7</sup> In the 16th century, Ambroise Paré, the official French royal surgeon, reported what was probably a delayed death due to an acute traumatic hemopericardium. He observed a gentleman who received a wound from a duel under the left breast but continued to strike blows and chase his fleeing enemy some 200 paces before he died. At autopsy, Paré found a wound in the heart "so large as would contain one's finger, and there was much blood that poured forth upon the midriff."<sup>7</sup>

The tamponade effect of pericardial effusion was first observed in 1669 by the Cornish physician Richard Lower: "Although the fluid enclosed in the pericardium serves effectively for lubricating the surface of the heart and facilitating its movement, it sometimes happens that a profuse effusion oppresses and inundates the heart. The envelope becomes filled in hydrops of the heart; the walls of the heart are compressed by the fluid settling everywhere so that the heart cannot dilate sufficiently to receive the blood; then the pulse becomes exceedingly small, until finally it becomes utterly suppressed by the great inundation of fluid whence succeed syncope and death itself."<sup>8</sup> Giovanni Battista Morgagni, 1 of the most renowned anatomists of the 18th century, established several causes of hemopericardium. He showed that the puncture of a coronary artery could cause hemotamponade and described spontaneous cardiac rupture. He also made the important observation that the outcome of a heart wound was dependent on the rate of pericardial filling.<sup>5</sup>

An Austrian physician, Joseph Leopold Auenbrugger, was the first to introduce percussion as a diagnostic technique in 1761. He described clinical signs of pericardial effusion ("Auenbrugger's signs"), which consist of protrusion of the sternum and, in particular, bulging of the epigastrium and decreased resonance in Traube's space.<sup>5</sup> Despite its poor precision, percussion remained used until the 20th century to diagnose pericardial effusion. In 1873, Adolf Kussmaul, a German clinician, introduced the term "pulsus paradoxus" into clinical medicine, still 1 of the clinical hallmarks of cardiac tamponade. He described 3 patients in whom the pulse disappeared entirely at the height of inspiration while, paradoxically, the heartbeat remained regular.<sup>9</sup> This was an unfortunate use of the term "paradoxical," because pulsus paradoxus is in fact an amplification of the physiologic decrease in systemic arterial pressure during inspiration and not, as it implies, a decrease when an increase would be normal. The modern definition of pulsus paradoxus is a decrease in systolic blood pressure >10 mm Hg during inspiration.<sup>10</sup> Edmund Rose, a German surgeon, coined the term "cardiac tamponade" ("Herztamponade" in German) for the first time. In 1884, he presented cases of heart wounds that were fatal, not from exsanguination or from the extent of the injury itself but primarily from compression of the heart by a relatively small amount of blood locked in the pericardial cavity.<sup>11</sup>

### Advent of Cardiac Tamponade Therapy

Dominique Larrey, surgeon of Napoleon Bonaparte, is usually credited with the first open drainage of the pericardium, in 1810. In a soldier who developed a delayed tamponade after a self-inflicted stab wound in the chest, Larrey drained the pericardium 45 days after the injury and released approximately 1 L of fluid and clot. Although it led to considerable clinical improvement, the soldier died 23 days later from a suppurative pericarditis. Perhaps as early as 1801, a pericardial effusion was drained by Romero, a Spanish physician. Because the exact date of Romero's operation is not known, it seems appropriate that Larrey and Romero be recognized as the pioneers of open drainage of the pericardium.<sup>12</sup>

Franz Schuh, a Viennese physician, performed the first blind needle pericardiocentesis in 1840 on a 24-year-old woman with extreme dyspnea by introducing a trocar through the third and then the fourth intercostal space, from which sizable quantities of bloodstained fluid were aspirated. The patient immediately improved but subsequently died of a mediastinal neoplasm.<sup>13</sup>

In 1896, Ludwig Rehn first successfully performed the definitive treatment of traumatic cardiac tamponade consisting of surgical suture of the heart. A 22-year-old gardener had been stabbed in the fourth left intercostal space. There was no external bleeding, but 2 days later, the area of cardiac dullness increased, and his condition deteriorated. The operation was carried out through the fourth intercostal space with division of the fifth rib. Blood was seen to be emerging through a pericardial laceration which, when enlarged, revealed a large amount of clot and a 1.5-cm wound in the right ventricle that was closed with 3 interrupted silk sutures.<sup>12</sup>

## Epilogue

The murder of Elisabeth of Austria represents a parody of a florid cardiac tamponade, illustrating its pathophysiology and clinical aspects in a dramatic manner. The delay in the onset of the first symptoms was due to the progressive accumulation of blood leaking from the double perforation of the left ventricle into the intrapericardial space. The pressure surrounding the heart increased to a critical level, at which cardiac filling became severely clogged, thus causing an important decrease in stroke volume, leading to severe arterial hypotension. This explains the first syncope followed by an irreversible coma and finally death 60 minutes after the assassin's attack. On a purely theoretical basis, Empress Sissi could have been saved. The physiology and clinical signs of cardiac tamponade were already well known. Pericardiocentesis, the emergency treatment, had been performed for more than half a century, and the first myocardial suture had just been successfully attempted 2 years earlier.

More than a century after the death of Elizabeth of Austria, the steamboat Geneva is still moored on the lakefront. Although no longer in service, it is now a refuge where adults who find themselves in social or personal difficulties can find shelter. This boat, scene of the tragic death of an empress who all her life devoted herself to the less fortunate, could not have found a better ending.

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