Portrait of Jean-Baptiste Sénac (1693-1770). ***Courtesy of Moody Medical Library, The University of Texas Medical Branch at Galveston.***

Jean-Baptiste Sénac and His Treatise on the Heart

Inci A. Bowman, Ph.D.

Jean-Baptiste Sénac's treatise on the heart is considered a landmark in the history of cardiology. In Traité de la structure du coeur, de son action, et de ses maladies *(1749), Sénac dealt systematically with the anatomy, physiology, and pathology of the heart, offering the results of anatomical investigations and postmortem examinations. This paper focuses on Sénac's work on the muscular structure of the heart, as well as on the diseases of the cardiovascular system. It shows that palpitations, aneurysms, the dilatation and inflammation of the heart, valvular lesions, and blood clots, were among the problems frequently reported by Sénac and his contemporaries. Sénac's treatise is important because it reveals the state of the art in cardiology before the development of such diagnostic techniques as percussion of the chest and mediate auscultation.* ***(Texas Heart Institute Journal 1987; 14:5-11)***

Key words: History of medicine; cardiology/history; historical biography/Sénac

JEAN-BAPTISTE SÉNAC's *Traité de la structure du coeur, de son action, et de ses maladies* (1749) has been regarded as the first comprehensive textbook of cardiology.[1,2] Although the two-volume treatise was not the first work exclusively devoted to the heart, it provided coherent discussions of the anatomy, physiology, and diseases of the cardiovascular system. Sénac's *Traité* was written before the development of such diagnostic techniques as Leopold Auenbrugger's procedure for the percussion of the chest (1761) or R.T.H. Laennec's method of mediate auscultation with the stethoscope (1819). Sénac and his contemporaries gained their knowledge of the heart from anatomical dissections and postmortem examinations. This was a period when the new science of cardiology was closely allied with pathological anatomy, and correlating clinical data with autopsy reports posed the greatest challenge for physicians.

Jean-Baptiste Sénac was born in 1693 in the district of Lombez in Gascony, France. Nothing definite is known about his early life. He came to Paris when he was about thirty years old. In 1723, he was elected an associate member of the Academy of Sciences, and published his first book, *A New Course in Chemistry.* The following year, he brought out a French edition of Lorenz Heister's *Compendium anatomicum.*[3] Sénac's *L'Anatomie d'Heister,* which was not merely a French translation but an expanded version of the *Compendium*, went through three different editions. His association with Heister's widely used anatomy text helped establish him as a respected anatomist, and his early interest in anatomy would influence his later work in cardiology.

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In 1733, Sénac moved to Versailles, where he became physician to the royal family of Saint-Cyr and the Royal Hospital of Versailles. He was appointed consulting physician to the King in 1738, and served as physician to Maurice, Count de Saxe, from 1745 to 1750, accompanying him on his campaigns. He became chief physician to Louis XV in 1752 and was subsequently appointed counsellor of the state and superintendent of the mineral waters and medicinals in France. Sénac died on December 22, 1770, at the age of seventy-seven.[4,5]

By the time Sénac published his monumental work *Traité de la structure du coeur, de son action, et de ses maladies*,[6] he was 56 years old. The treatise represented the results of extensive research into the anatomy of the heart through countless autopsies he had conducted over a period of more than twenty years. Above all, Sénac's *Traité* offered a synthesis of what was known about the cardiovascular system in the middle of the eighteenth century. Works of other physicians had served as building blocks of his own edifice, Sénac said, but he confirmed or corrected what had been reported in the literature.[7]

The treatise includes four books, and covers more than 1,200 pages. Books 1 and 2 deal with the anatomy and physiology of the heart. Book 3 is an extensive review of literature on the circulation of the blood from ancient times to the post-Harveian period. Book 4 is devoted to the diseases of the heart. In the remainder of this essay, I would like to focus on the first and last books of the treatise.

Sénac's investigations into the structure of the heart constitute one of his most important contributions to the development of cardiology. In Book 1, *De la structure du coeur*, not only did he give an elaborate review of the work carried out by earlier investigators, but he reported his own observations on the fibrous structure of the heart. Sénac presented a systematic treatment of cardiac anatomy, devoting separate chapters to such topics as pericardium, ventricles, auricles, valves, coronary vessels, cardiac nerves, and the formation and structure of the fetal heart. Chapter 9 of Book 1 includes the results of Sénac's investigations of the fibers of the myocardium, supplemented by ten engraved plates.

Until the seventeenth century, the heart had often been regarded as the seat of the soul or the "vital heat." Even William Harvey, while recognizing the muscle activity of the heart, had stressed the spiritual qualities of the heart and the blood; and when Nicolaus Steno, the Danish anatomist and clergyman (1638-1686), reported the results of his investigations into the muscular nature of the heart, his views were not readily accepted. In *De musculis et glandis* (1664), Steno pointed out that the heart consists of fibers, arteries, veins, nerves, and membranes. ". . . I think I am able to prove," Steno wrote, "that there exists nothing in the heart that is not found also in a muscle. . . ."[8]

Even more influential than Steno's views was the work of Richard Lower (1631-1691). In *Tractatus de corde* (1669), Lower gave a description of the muscular anatomy of the human heart, comparing its fibrous structure to that of other animals. The first chapter and four plates of *Tractatus de corde* deal with cardiac muscles. Lower's work helped to establish the fact that the heart is a muscular structure, well supplied with nerves, and to further dispel the then commonly held view that the blood moves at least partly by its own power.[9]

In Book 1, Sénac acknowledged the accomplishments of Lower as well as those of Heister, who had also given an account of cardiac musculature in his *Compendium anatomicum* (1717). Both Lower and Heister had merely described the general direction of the fibers, but Sénac, inspired by Heister's approach, provided a detailed description of the intricate structure of the heart, including the coronary vessels. (See, for example, Figures 1 and 2.) His work on the muscles of the heart remained an authoritative source and was frequently cited.[2]

As Sénac repeatedly emphasized, knowledge of the muscular structure of the heart was essential to understanding health and disease. Because the principle of life, closely linked with the motion of blood, lay within the heart (which Sénac considered "an obscure machine"), any attempt to understand the diseases of the heart would involve knowing first the exact structure and action of the heart in maintaining normal physiological functions.[10]

Sénac also acknowledged the difficulty of investigating anatomical structures. Noting the

TRAITE
DE
LA STRUCTURE
DU CŒUR,
DE SON ACTION,
ET
DE SES MALADIES.

Par M. SENAC, Médecin Conſultant du Roy.

Multùm egerunt qui ante nos fuerunt, multùm etiam adhuc reſtat operis : multúmque reſtabit ; nec ulli nato poſt mille ſæcula præcludetur occaſio aliquid adjiciendi. Ann. Seneca.

TOME PREMIER.

A PARIS,

Chez JACQUES VINCENT, rue & vis-à-vis l'Egliſe de S. Severin, à l'Ange.

M DCC XLIX.

AVEC APPROBATION ET PRIVILEGE DU ROY.

Title page of Jean-Baptiste Sénac's treatise on the heart. *Courtesy of Moody Medical Library, The University of Texas Medical Branch at Galveston.*

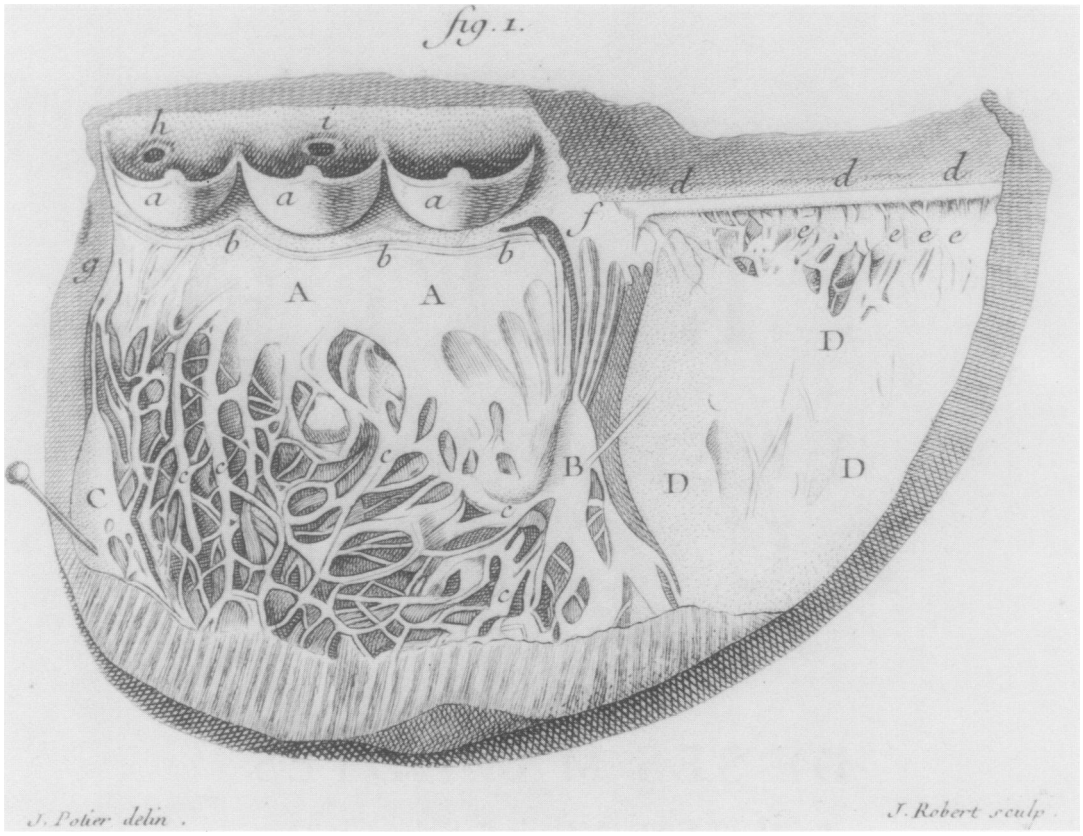

Fig. 1 Plate 13 from Jean-Baptiste Sénac's *Traité de la structure du coeur* (1749). It shows the area below the aorta, including the sigmoid valves, openings of coronary arteries, chordae tendineae, and papillary muscles. *Courtesy of Moody Medical Library, The University of Texas Medical Branch at Galveston.*

variations that exist in nature, he stressed the problems of ascertaining the form of a particular part. "Although Nature is fairly consistent in the construction of parts," Sénac said, "she sometimes deviates from her path."[11] He made a point of observing the same structure several times before he reached a definite conclusion about its form.

Des maladies du coeur, the fourth book of Sénac's *Traité*, brought together various reports and observations on diseases of the heart, drawing on a considerable body of literature that existed on such topics as coronary sclerosis, aneurysms, valvular diseases, and inflammation of the heart tissues.

A full century before, in a letter to Jean Riolan, William Harvey had referred to the possibility of circulation through the coronary arteries and veins. Riolan also had an interest in the coronary vessels, and his dissections confirmed earlier observations by Andreas Vesalius and Gabrielle Fallopius.[12] In 1704 Frederik Ruysch further elucidated the anatomy of coronary vessels by using a special injection technique, and even earlier–in 1698–Pierre Chirac, a French investigator, had shown that the ligation of a coronary vessel in the dog produced cardiac standstill.[13] About this time, investigators also began reporting their observations on "ossified" vessels. (The term ossification was used for calcification in those days.) Early descriptions of the calcification of coronary vessels were provided by Lorenzo Bellini in *De morbis pectoris* (1703) and by A.C. Thebesius in *De circulo sanguinis in corde* (1708).[14,15]

The works of two other physicians, Raymond Vieussens (1635-1715) and Giovanni Maria

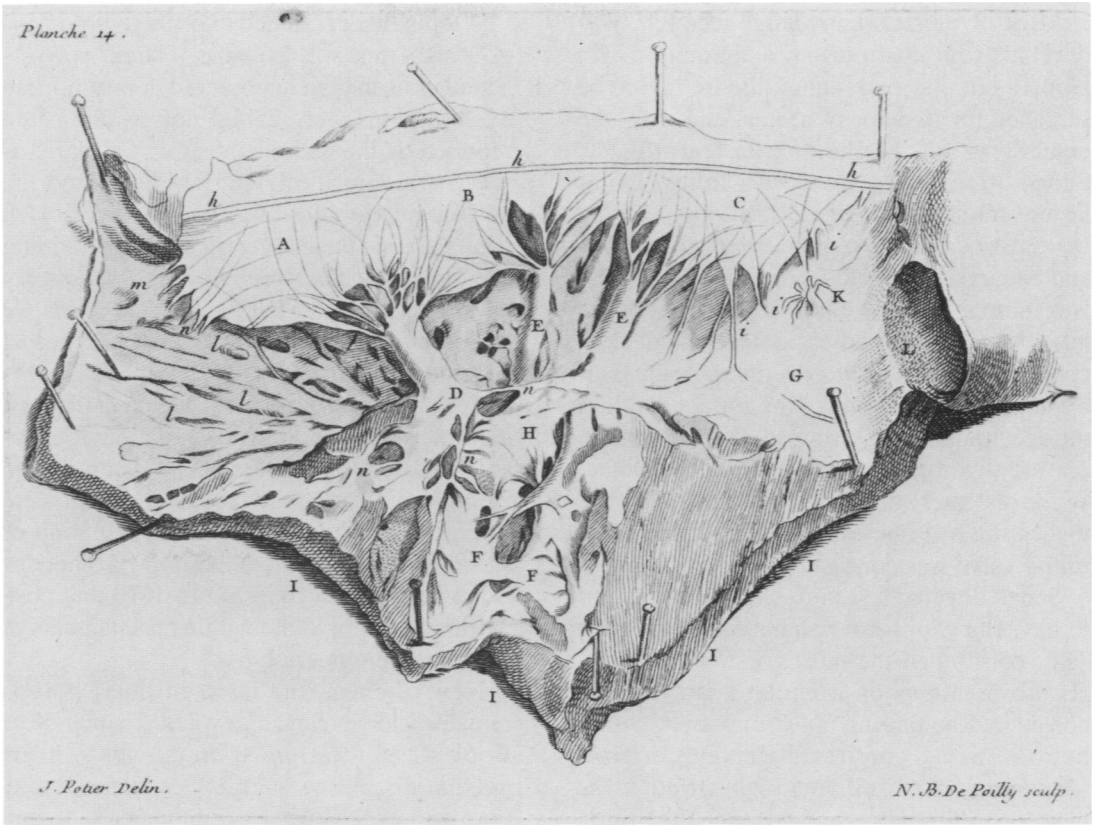

Fig. 2 Plate 14 from Jean-Baptiste Sénac's *Traité de la structure du coeur* (1749). It illustrates the interior of the right ventricle and the dissected tricuspid valve. *Courtesy of Moody Medical Library, The University of Texas Medical Branch at Galveston.*

Lancisi (1645-1720), are important in our review of early-eighteenth-century cardiology. Sénac held both Vieussens and Lancisi in high esteem and often cited them in his *Traité*.

Vieussens, the Montpellier physician, is best known for the first clear description of mitral stenosis. In *Traité nouveau de la structure et des causes du mouvement natural du coeur* (1715), he reported the clinical course of several patients suffering from heart disease, along with the postmortem findings. He focused on the pericardium, coronary vessels, and muscle fibers of the heart. Chapter 16 of this work includes his famous description of the internal surface of the left ventricle and the malfunctioning mitral valve.[16]

Lancisi served as physician to several popes at the Vatican. In 1706 Pope Clement XI asked him to investigate an increasing number of sudden deaths in Rome. Reporting his investigations in *De subitaneis mortibus* (1707), Lancisi showed that many of the deaths were due to hypertrophy and dilatation of the heart, as well as to diseased heart valves. In another work, *De motu cordis et aneurysmatibus* (published posthumously in 1728), Lancisi demonstrated the syphilitic origin of some heart lesions, focusing on different kinds of aneurysms.[17]

In *Des maladies du coeur*, Sénac discussed the difficulties in understanding heart disease. He often expressed his regret that, as a result of the close interaction between the cardiovascular system and the nervous and respiratory systems, information about heart disease was especially elusive.[18] In Sénac's time, checking the pulse and listening to the chest (direct auscultation) were the major diagnostic techniques in determining the presence of heart disease.

Most of Sénac's knowledge, though, was derived from postmortem examination. He pointed out that truth about disease had to be searched for in autopsy rooms, and that "the dead served as books of true learning."[19] Sénac offered a summary of cardiovascular lesions frequently observed at autopsy. Among the most common problems were dilatations and aneurysms. Dilatation of the right auricle was more frequently observed than that of the left, and dilatation of the auricles seemed more common than that of the ventricles. Aneurysms of pulmonary veins and of the aorta, as well as the accumulation of serous fluid in the pericardial sac (hydropericardium), were often noted. While one rarely observed "ossification" of the myocardium, Sénac reported, hardening of the mitral valve was common.[20]

Sénac devoted an entire chapter of Book 4 to the subject of heart palpitations, which, he said, constituted the most common problem. His observations on irregular heart beat are considered among his most important contributions. Sénac confirmed Harvey's original observation of a fibrillating right atrium in the heart of a dying dog, and described the fibrillation of the ventricles.[21] Correlating observed symptoms with findings at autopsy, he discussed the role played in palpitation by a diseased mitral valve or an enlarged ventricle. He nevertheless emphasized that heart palpitations observed in certain cases (fever, exercise, or mental stress) are not dangerous and do not indicate heart disease.

Sénac recommended highly the use of cinchona (Peruvian bark) in the treatment of heart palpitations. "Of all the stomachic remedies, the one whose effects have appeared to me the most constant and the most prompt in many cases," he said, "is *quinquina* [Peruvian bark] mixed with a little rhubarb."[22,23] Although Sénac was not the first to use cinchona in therapy, his application of it as a remedy against palpitation has been regarded as a significant contribution.[24] It is also worth noting that Sénac was the author of a book on malaria and was likely familiar with the use of quinine in the treatment of malaria.[25] Earlier in the century, Lancisi had conducted research on malaria epidemics in Rome and had strongly recommended the use of cinchona bark, the controversial drug from the New World.

A topic that continued to interest physicians of Sénac's time was the issue of heart "polyps." Blood clots that were observed at postmortem examinations were called polyps and often reported as the cause of death.[26] As early as 1507, Antonio Benivieni had discussed the pathological implications of a piece of black flesh found in the left ventricle, thus providing one of the first descriptions of heart polyps. By the time Marcello Malpighi published his *De polypo cordis* in 1666, these heart polyps had become familiar pathological entities. In this early treatise on hematology, Malpighi reported his experiments with the coagulation of blood and his discovery of the red blood corpuscles. He maintained that the so-called polyps were lesions that resulted from the coagulation of blood at death.[27] A contemporary, Theodor Kerckring, also recognized in 1670 that postmortem thrombi found within the chambers of the heart were not polyps.[28]

Nevertheless, the issue of heart polyps remained alive. Sénac devoted Chapter X of Book 4, *Des maladies du coeur*, to heart polyps, discussing such issues as the formation, variety, and causes of blood clots. Often citing Malpighi, he reviewed the various reports and concluded that certain types of polyps were formations occurring at the time of death. But he did not rule out the existence of clots formed in the blood vessels during life, with deleterious effects on cardiovascular function. Physicians continued to discuss heart polyps well into the nineteenth century. The modern concept of "thrombosis" had its origin in the work of Rudolf Virchow (1821-1902), the physician who coined the word.

Sénac's *Traité* remained an influential work throughout the eighteenth century. A revised edition, corrected and enlarged by Sénac, with additions by A. Portal, was published posthumously in 1774, and again issued in 1777 and 1783. Two separate editions of the section on heart diseases appeared under the title *Traité des maladies du coeur* in 1778 and 1783. An Italian translation (1773) and a German translation (1781) have also been recorded. Sénac's contemporaries regarded the *Traité* as an authoritative work in cardiology. Both Albrecht von Haller and Giovanni Battista Morgagni spoke highly of Sénac's treatise.[30] Jean-Nicolas Corvisart, the French physician

who popularized Auenbrugger's method of percussion and in 1806 published the next important work on heart disease, admired Sénac's accomplishments in describing the pathological anatomy of the heart. The more one studies morbid anatomy, Corvisart said, the more accurate will be one's diagnosis of heart disease.[31] Historically, Sénac's treatise is important because it was the first systematic work embracing the anatomy, physiology, and pathology of the heart. The work reveals cardiology's origins and its intimate alliance with pathological anatomy, before it evolved into a full-fledged medical specialty.

Note: Sénac's name has been spelled variously in the secondary literature as Jean-Baptiste de Sénac, Jean-Baptiste Senac, or Jean-Baptiste Sénac. In this paper, I have chosen to use the version given in *Grand Larousse encyclopedique*: Jean-Baptiste Sénac.

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