

# Cardiovascular Disease in *The Adventures of Sherlock Holmes*

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**T**he *Adventures of Sherlock Holmes* by Sir Arthur Conan Doyle contains many incidents of medical interest. While disorders of the cardiovascular system do not play an important role in these tales, there are, nevertheless, some illnesses that invite speculation. Eleven such incidents are reviewed and discussed in light of the times in which they occurred and in light of current medical knowledge. *Arch Intern Med.* 2001;161:701-705

Of the fictional characters who have attained immortality, none has acquired as faithful a following of admirers as has Sherlock Holmes, described as “the greatest detective who never lived.” At least 5 “biographies” have been written on the famous man with the deerstalker hat and pipe, and he has been featured in several stage, movie, and television performances. While other fictional persons are revered or despised for the roles they have played, their fame is relegated to the past. Holmes and his worthy colleague, John H. Watson, MD, are likely to live forever.

Given the medical background of Sir Arthur Conan Doyle, it is not surprising that various aspects of clinical medicine appear in his writings. Most of these have been described by Holmes’ companion Watson, but written as they are for a non-medical reading public, clinical detail is scanty. Diseases of the cardiovascular system do not play a prominent part in the adventures of this dynamic duo. The largest series so far describes in some detail 4 incidents: Arthur Morstan’s sudden death and Thaddeus Sholto’s cardiac neurosis take place in *The Sign of Four*, Sir Charles Baskerville dies in *The Hound of the Baskervilles*, and the dramatic description of Jefferson Hope’s aortic aneurysm is related in *A Study in Scarlet*. Abnormalities of the pulse are briefly mentioned in “The Adventure of the Priory School” and “The Adventure of the Stockbroker’s Clerk,” and

a passing reference is made to dropsy in “The Adventure of Shoscombe Old Place.”<sup>1</sup> Four more incidents are identified, and all 11 events are analyzed in greater detail in what I believe to be the most complete description of cardiovascular diseases in *The Adventures of Sherlock Holmes*.

Palpation of the pulse is the classic first step in evaluation of the cardiovascular system and, indeed, in the examination of any critically ill patient. Watson makes 2 references to an abnormal pulse. In “The Adventure of the Stockbroker’s Clerk,” an attempt at duplicity by the manager of the Franco-Midland Hardware Company resulted in dismal failure. Disguising himself as his own brother, this worthy gentleman attempted to swindle a large investment firm. Unfortunately, his broad smile in both guises revealed an identical gold filling, an astute observation made by the stockbroker’s clerk. To avoid prosecution and shame, Harry Pinner attempted to hang himself, and was rescued “just in time” by Holmes and Watson. “What do you think of him?” asks Holmes, in response to which Watson relates: “I stooped over him and examined him. His pulse was feeble and intermittent, but his breathing grew longer. . . . ‘It has been touch and go with him’ I said, ‘but he’ll live now.’”<sup>2(p371)</sup>

In judicial hanging, the placement of the knot on the noose and the degree of drop are designed to cause instant death by compression of the spinal cord.<sup>3</sup> This technique not being familiar to the inexperienced, suicidal hanging often results in fail-

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ure. Cerebral hypoxemia is followed by acidosis and hypoxia of the myocardium. Neck traction produces automatic reflex activity, stimulating the carotid sinus and parasympathetic network in the pericarotid area. Irregular bradycardia that follows leads to asystole and cardiac arrest.<sup>4</sup> This fatal outcome was averted by Watson's rapid resuscitative efforts. The second instance of an abnormal pulse is seen in "The Adventure of the Priory School." In this saga, the dignified headmaster, Thorneycroft Huxtable, MA, PhD, collapses immediately on entering Holmes' living room. Watson's examination revealed a "thready pulse." "What is it, Watson?" asked Holmes. 'Absolute exhaustion—possibly mere hunger and fatigue,' said I [Watson], with my finger on the thready pulse, where the stream of life trickled thin and small."<sup>2(p539)</sup>

There seems little doubt that this scholar had experienced great physical stress. Having run to the point of exhaustion, he was probably dehydrated, a diagnosis in which I concur with Watson. The ensuing hypovolemia accounted for his thready pulse. Having had a glass of milk and a biscuit, Huxtable made a rapid recovery.

The most dramatic cardiac illness in Watson's experience was that of the Mormon, Jefferson Hope. Having followed his quarry over 3 continents for more than 2 decades, Hope tracks down his adversaries and murders them. When apprehended by the law, the following scene, as related by Watson, ensues:

"I've got a good deal to say," said our prisoner slowly, "I want to tell you gentlemen all about it."

"Hadn't you better reserve that for your trial?" asked the inspector.

"I may never be tried." He answered. "You needn't look startled. It isn't suicide I am thinking of. Are you a doctor?" He turned his dark, fierce eyes upon me as he asked this last question.

"Yes, I am," I answered. "Then put your hand here," he said with a smile, motioning with his manacled wrists towards his chest. I did so; and became at once conscious of an extraordinary throbbing and commotion which was going on inside. The walls of his chest seemed to thrill and quiver as a frail building would do inside when some powerful engine was at work. In the silence of the room, I could hear a dull humming and buzzing noise which proceeded from the same source.

"Why," I cried, "You have an aortic aneurism!"<sup>2(p77)</sup>

It is not surprising that Watson, who obtained his doctor of medicine degree from the University of London, London, England, and received his clinical training at Saint Bartholomew's Hospital, London, was able to make the clinical diagnosis instantly. But then again, given Hope's clinical presentation, there was really no other tenable diagnosis. Osler's description of the physical findings in aortic aneurysm is not much different from that of Watson:

An external tumor is present in many cases, projecting through the upper part of the sternum . . . the impulse is as a rule, forcible, slow, heaving, and expansile. The hand upon the sac, or on the region in which it is in contact with the vessel wall, feels in many cases a diastolic shock, often of great intensity, which forms one of the valuable physical signs of aneurysm.<sup>5(pp673-674)</sup>

The cause of Hope's aortic aneurysm remains to be considered. Hope attributed his illness to "over-exposure

and under-feeding among the Salt Lake Mountains,"<sup>2(p77)</sup> but Ziegler observes, rather cynically, "Though under-feeding had nothing to do with it, over-exposure certainly did, namely, over-exposure to the spirochete, though this is not what Hope meant to imply."<sup>6(p224)</sup>

Syphilis is the major cause of aneurysms of the ascending aorta and the aortic arch. An autopsy study<sup>7</sup> of 100 cases of syphilitic aortitis showed that changes were invariably found in the ascending aorta. In a review of aneurysm of the aorta, Osler states, "There is only one infection of any moment with which aneurysm is connected, namely syphilis."<sup>8(p535)</sup> There seems little doubt, therefore, that syphilis was the cause of Hope's aortic aneurysm. Hope later observes, "I am on the brink of the grave. . . ."<sup>2(p77)</sup> (a prognosis rapidly confirmed when his aneurysm ruptured in the next 24 hours).

Intractable heart failure and 2 episodes of sudden death occur in the adventures of Holmes and his indefatigable partner. In "The Adventure of Shoscombe Old Place," John Mason, head trainer of the Shoscombe stables, tells Holmes: "Of course, with her [Lady Beatrice Falder] weak heart and dropsy, one couldn't expect that she could get about without him."<sup>2(p1104)</sup>

Later, when Sir Robert is brought to book, he says: "My sister died of dropsy which had long afflicted her. . . . Her doctor would certify that for months her symptoms have threatened such an end."<sup>2(pp1111-1112)</sup> (He was referring to Lady Beatrice's demise a week earlier.)

Dropsy, or fluid retention, was a common diagnosis at the time. That Falder's dropsy was of cardiac origin is substantiated by Mason's observation that she had a "weak heart." The deceased is never seen or heard in the tale related, and given the paucity of clinical information provided, no more can be said. There seems little doubt, however, that she had intractable heart failure, a fact recognized by her physician and voiced as a poor prognosis.

In *The Hound of the Baskervilles*, some aspects of Sir Charles Baskerville's illness, being provided by a physician, are more complete than in other narratives. The opinion of James Mortimer, as reported in the *Devon County Chronicle*, reads as follows:

The evidence . . . points especially to some affection of the heart. Doctor James Mortimer, the friend and medical attendant of the deceased, has given evidence to the same effect. . . . The doctor's evidence pointed to an almost incredible facial distortion—it was explained that that is a symptom which is not unusual in cases of dyspnea and death from cardiac exhaustion. This explanation was borne out by the post-mortem examination.<sup>2(pp676-677)</sup>

Mortimer confirms this report when he tells Holmes, "His heart was, I knew, affected."<sup>2(p678)</sup>

Baskerville's body was found with "features convulsed with some strong emotion."<sup>2(p679)</sup> One assumes that Baskerville was running away from someone or something—perhaps a hound—and succumbed to a terminal cardiac event.

*The Sign of Four* provides 3 incidents of interest. Major John Sholto reveals to his son Thaddeus (who had a problem of his own, to be described later) a secret that he had harbored for many years. We are told that the

major had “suffered for many years from an enlarged spleen.”<sup>2(p102)</sup> On his deathbed, he expressed a wish to make a last communication to his son. “When we entered his room, he was propped up with pillows and breathing heavily.”<sup>2(p102)</sup>

The picture presented is suggestive of a patient with advanced left ventricular failure; but what might have been the antecedent illness? We know that much of John Sholto’s life was spent in India, where kala azar (visceral leishmaniasis) and malaria were endemic. Acute anemia is characteristic of visceral leishmaniasis,<sup>9</sup> and pulmonary edema may develop in patients with malaria who develop intravascular hemolysis.<sup>10</sup> Either condition could well have been the cause for the heart failure manifesting as orthopnea.

John Sholto’s account included some details of the illness and the death of a colleague, Captain Arthur Morstan.

“I will tell you how Morstan died” he continued. “He had suffered for years from a weak heart . . . I alone knew it. . . . Morstan had sprung out of his chair in a paroxysm of anger, when he suddenly pressed his hand to his side, his face turned a dusky hue, and he fell backward cutting his head against the corner of the treasure chest. When I stooped over him, I found to my horror that he was dead.”<sup>2(p103)</sup>

Morstan’s antecedent cardiac history and his pressing his hand to his side suggest that sudden coronary occlusion was the terminal event. An increase in blood pressure brought on by his paroxysm of anger could have been the precipitating event. John Hunter, the English anatomist who had angina pectoris, is reported to have said that he was at the mercy of any rascal who saw fit to make him angry. And so it was with Morstan.

Thaddeus Sholto, John Sholto’s son, was perhaps the only person to have sought Watson’s professional opinion outside his consulting rooms:

“A doctor eh!” he cried, much excited. “Have you your stethoscope? Might I ask you—would you have the kindness? I have grave doubts as to my mitral valve, if you would be so very good. The aortic I can rely upon, but I should value your opinion upon the mitral.”

I listened to his heart as requested, but was unable to find anything amiss, save, indeed, that he was in an ecstasy of fear. . . . “It appears to be normal,” I said. “You have no cause for uneasiness.”

“You will excuse my anxiety, Miss Morstan,” he remarked airily. “I am a great sufferer, and I have long had suspicions as to that valve. I am delighted to hear that they are unwarranted.”<sup>2(pp100-101)</sup>

Thaddeus Sholto clearly manifested the features of cardiac neurosis. This condition, most often associated with a fear of coronary artery disease, has also been reported in persons with valvular disease of the heart. Rheumatic fever was widely prevalent in India, and involvement of the mitral and aortic valves is a common late consequence of the disease. Perhaps Thaddeus Sholto had a febrile illness and his knowledge of the valve complications of some types of fever induced in him a fear of heart disease. Neuroses associated with rheumatic valvular heart disease have been reviewed by Viko.<sup>11</sup> The type of anxiety Thaddeus Sholto manifested is that de-

scribed as introspective neurosis, a condition in which the patient has a fear of having diseased heart valves in the absence of any signs of such an illness. Thaddeus Sholto was probably well aware of his unjustified concern, as reflected in his comment to Miss Morstan. One suspects that his delight on learning that his heart valves were unaffected will be short-lived.

Whether 1 or 2 bullets injured Watson while serving in India has perplexed Holmesian scholars for more than a century. Sovine<sup>12</sup> believes that a single bullet entered Watson’s left shoulder, exited anteriorly, reentered his left leg, and came to rest in the calf muscle. Van Liere<sup>13</sup> also subscribes to the single-bullet hypothesis, but regards Sovine’s argument as specious. He believes that transient episodes of amnesia account for the differing sites of the wound described by Watson, and ascribes this intermittent loss of memory to a subclavian steal effect caused by the injury to that vessel.

The 2-bullet theory, which I believe is correct, states that Watson sustained 2 distinct injuries, for the trajectory of the single bullet as described by Sovine<sup>12</sup> is highly unlikely. By his own accounts, Watson sustained at least 2 wounds. In *A Study in Scarlet*, he relates, “There I was struck on the shoulder by a Jezail bullet which . . . grazed the subclavian artery.”<sup>2(p15)</sup>

The Jezail rifle was a heavy, long-barreled musket with a swiveling muzzle manufactured by a tribe of the same name located on the India-Afghanistan border. It was here, in the battle of Maiwand, that Watson sustained his injuries. Inclement weather appears to have affected Watson, for in *The Sign of Four* he says, “I had had a Jezail bullet through it [leg] some time before, and though it did not prevent me from walking, it ached wearily at every change of the weather.”<sup>2(p90)</sup>

Later in the same narrative, Holmes expresses much concern about his companion’s leg.

“Are you game for a six-mile trudge, Watson?”

“Certainly.” I answered.

“Your leg will stand it?”

“Oh, yes.”<sup>2(pp118-119)</sup>

On another occasion, in “The Adventure of the Noble Bachelor,” Watson observes, “I had remained indoors all day, for the weather had taken a sudden turn to rain, with high autumnal winds, and the Jezail bullet which I had brought back in one of my limbs as a relic of my Afghan campaign throbbed with dull persistence.”<sup>2(p287)</sup>

Other lapses in Watson’s memory are evident. Although a meticulous chronicler of Holmes’ adventures, he seems to have forgotten the dates of key events in his own life. It is clear that he married Mary Morstan in 1888, ie, 6 years after she answered an advertisement in the *Times* of May 4, 1882. Yet, in “The Five Orange Pips,” which took place in 1887, Watson indicates that his wife was “on a visit to her mother’s.”<sup>2(p218)</sup> Mary Morstan’s mother was not alive at the time of her engagement to Watson, so she could not have been visiting her mother. Can Watson’s episodes of amnesia (or confusion) be explained by the injury to his subclavian artery, as suggested by Van Liere?<sup>13</sup> I think they can. Thirty years after Van Liere’s proposal, Blasco et al<sup>14</sup> describe a patient with transient global amnesia caused by subclavian steal.

This episodic symptom complex is manifested by confusion and amnesia, with preservation of consciousness and higher cognitive functions. Amnesia was the probable cause of Watson's inability to remember dates and events in his personal life, and that amnesia was a consequence of a bullet having "grazed" his left subclavian artery.

Watson's last meeting with Holmes was near the falls of Reichenbach (near the village of Meiringer in Switzerland), which the former describes in vivid detail.

It is indeed a fearful place. The torrent, swollen by the melting snow, plunges into a tremendous abyss, from which the spray rolls up like the smoke from a burning house. The shaft into which the river hurls itself is an immense chasm, lined by glistening coal-black rock, and narrowing into a creaming, boiling pit of incalculable depth, which brims over and shoots the stream onward over its jagged lip.<sup>2(p478)</sup>

Into this maelstrom Doyle murderously consigned Holmes and James Moriarty. In response to outcries from his reading public, Doyle, with much reluctance, resurrects Holmes. No longer residing at 221B Baker Street, Watson returns to his home in Kensington, England, when the maid announces a visitor, an elderly deformed bookseller who sought audience with the physician.

"Well, Sir, if it isn't too great a liberty, I am a neighbor of yours, for you'll find my little bookshop at the corner of Church Street. Maybe you collect yourself, sir. . . . With five volumes, you could just fill that gap on the second shelf. It looks untidy, does it not, sir?"

I moved my head to look at the cabinet behind me. When I turned again Holmes was smiling at me across my study table. I rose to my feet and stared at him . . . and then it appears I must have fainted for the first and last time in my life.<sup>2(p485)</sup>

There seems little doubt that neurocardiogenic syncope was the cause of Watson's transient loss of consciousness. Emotional stress is a common precipitating cause, and certainly seeing a man presumed dead come alive was more than sufficient reason to unsettle the nerves of even a war veteran. Inappropriate peripheral vasodilation and relative bradycardia brought about by depressed sympathetic activity with augmentation of the parasympathetic receptors lead to progressive hypotension and syncope.<sup>15</sup>

In "The Adventure of the Lion's Mane," we learn that Holmes was on the scene of a mystery after retirement: "It occurred after my withdrawal to my little Sussex home, when I had given myself up entirely to that soothing life of Nature for which I had so often yearned during the long years spent amid the gloom of London."<sup>2(p1083)</sup>

This is one of the few tales in which Holmes is his own chronicler, for "the good Watson had passed almost beyond my ken."<sup>2(p1083)</sup>

Fitzroy McPherson was "A science master whose life had been crippled by heart trouble following rheumatic fever."<sup>2(p1084)</sup> Soon after a swim—or so it appeared—McPherson was found "staggering like a drunken man,"<sup>2(p1084)</sup> and in a few minutes he was dead. The science master's colleague, Ian Murdoch, was similarly afflicted a few days later, but not having preexisting heart disease, he was revived with half a tumbler of brandy. Physical ex-

amination revealed Murdoch to have "Crisscrossed upon the man's naked shoulder, the same reticulated pattern of red, inflamed lines which had been the death-mark of Fitzroy McPherson."<sup>2(p1092)</sup>

On inspection of the "deadly lagoon," Holmes detected the coelenterate *Cyanea capillata*, and deemed the toxin of this marine animal to be the cause of death of one person and near death of another. While most *Cyanea* species are small, they can be large, with tentacles that can extend to 120 feet.<sup>16</sup> Holmes' suspicion of the cause of death was raised by the study of a book in his own library, in which J. G. Wood gives a true account of his untoward experience with this fearsome creature:

Both the respiration and the action of the heart became affected, while at short intervals sharp pangs shot through the chest. Then the pulsation of the heart would cease for a time that seemed an age, and then it would give six or seven leaps, as if it would force its way through the chest.<sup>17(pp141-142)</sup>

Studies<sup>18,19</sup> on biologically occurring histamine releasers have shown that the infusion of as little as 0.1 mg of extract of *C capillata* can produce a histamine response. It is likely that the release of such factors caused anaphylaxis through activation of histamine<sub>1</sub> and histamine<sub>2</sub> receptors, resulting in vascular permeability leading to a decrease in systolic blood pressure.<sup>20</sup>

Cardiac arrhythmias, including supraventricular tachycardia and ventricular fibrillation, occur in patients with cardiovascular collapse, and in a series<sup>21</sup> of 227 patients, 7 did not respond to resuscitation. One patient with severe preexisting cardiac disease was found at autopsy to have massive myocardial infarction.<sup>21</sup> These pathophysiologic changes are the likely cause for the symptoms described by Wood.<sup>17</sup> They were also probably responsible for the death of McPherson, who was "crippled by heart trouble," although Murdoch, who was not so affected, recovered from his misadventure.

I have attempted to critically analyze incidents of cardiovascular interest in *The Adventures of Sherlock Holmes*. In doing so, I have correlated clinical presentations with the illnesses extant at the time and treatments then available, and interpreted them in light of pathophysiologic concepts of disease known today.

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### Correction

**Missing Subtitle.** In the Original Investigation by Rollman et al titled "The Electronic Medical Record," published in the January 22, 2001, issue of the ARCHIVES (2001;161:189-197), the subtitle of the article was missing. Following the title on page 189, the subtitle should have read "A Randomized Trial of Its Impact on Primary Care Physicians' Initial Management of Major Depression." The journal regrets the error.