Angina of Micturition

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A patient recently came under our care who suffered from angina pectoris which was precipitated by micturition. Because of this unusual clinical association and the striking similarity to a famous historical case of angina pectoris, the case history and limited laboratory observation are recorded in detail.

Case History

R. C., a 46-year-old Negro male, was admitted to the Duke Medical Center in August 1960, with chest pain, fever, and chills. He had had chorea at age 7 and frequent epistaxis and migratory polyarthritis in early adult life. When 32 years of age, he had an episode of peripheral edema and migratory polyarthritis and was told he had "rheumatism." Four years later he experienced intermittently for several weeks a dull, aching anterior chest pain without radiation, unrelated to exertion. Three weeks prior to admission he experienced a similar type pain which increased in frequency and was precipitated by exertion. Progressive weakness, loss of energy, anorexia, and occasional chills and fever were experienced. He denied dyspnea, orthopnea, edema, palpitations, or hemoptysis. The patient also had noted some urinary urgency and frequency during the several weeks prior to admission.

Physical examination revealed a blood pressure of 110/40/0 mm. Hg, without pulsus alternans or paradoxx; pulse 94 and regular; respiration 20; temperature 39 C. The patient was a well-developed, well-nourished, acutely and chronically ill Negro male with mild orthopnea. The heart was enlarged to the left, with the apical impulse located in the sixth left intercostal space at the anterior axillary line. Systolic thrills were present over the primary and secondary aortic areas. P2 and M1 were greatly accentuated. There was a grade iv/vi aortic systolic ejection murmur, well transmitted to the neck. A grade iii/vi diastolic decrescendo murmur was present along the left sternal border. A mid-diastolic rumble was heard at the left lower sternal border and at the apex as well as a prominent early diastolic gallop.

Marked peripheral signs of aortic insufficiency were present. The remainder of the physical examination was within normal limits.

Accessory clinical findings were hemoglobin, 12.2 Gm./100 ml. blood; hematocrit level, 36 per cent; white blood cell count, 11,400 cells/mm.3, with a normal differential count; erythrocyte sedimentation rate, 56 mm./hour. The urine specific gravity was 1.026, with a trace of protein; microscopic examination was unremarkable. Tuberculin and fungus skin tests were negative. The antistreptolysin-O titer was 100 units; peripheral and spinal fluid serologic test for syphilis was non-reactive. The serum electrolytes were normal. Six blood cultures were negative.

The electrocardiogram demonstrated first-degree heart block, horizontal axis, and left ventricular hypertrophy with digitalis effect or left ventricular ischemia. X-rays and fluoroscopy of the chest showed left ventricular predominance with marked pulsations of the aorta.

Inactive rheumatic heart disease with subacute bacterial endocarditis was strongly suspected, despite six negative blood cultures. Aortic insufficiency was considered to be hemodynamically the predominant valvular lesion with auscultatory signs of aortic stenosis and mitral stenosis. The patient was in congestive heart failure, and the chest pains were attributed to angina pectoris. He was treated with 40 million units of penicillin and 2 Gm. of streptomycin daily. On this program he became afebrile. The signs of failure subsided following digitalization, salt restriction, and diuretics. His clinical course showed improvement.

During the third week of therapy the patient experienced for the first time substernal chest pain while urinating. This pain was quite typical of his previous episodes of exertional chest pain with radiation to the left shoulder and left arm. The pain lasted 1 to 3 minutes and was associated with mild dyspnea and diaphoresis. It was not rapidly relieved by placebo, but promptly subsided following sublingual nitroglycerin. Similar pain was not produced by straining at stool, a Valsalva maneuver even with a full bladder, smoking, change of posture, and genital manipulation. Exertion (walking) in the latter days of hospitalization did not provoke a similar chest pain.

Urination in the supine or erect position was an equally effective stimulus for producing the pain. On repeated occasions, when the patient experi-

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Figure 1

enceed the desire to void, hesitating 30 to 60 minutes did not precipitate the pain, but actual voiding did bring the pain on 30 to 60 seconds after the onset of micturition. The volume of urine that precipitated the pain ranged from 30 to 500 ml. After recognition of the relationship, at no time did he void without pain, except on three occasions when he received one nitroglycerin tablet prior to voiding.

Intraarterial blood pressures were recorded during the control period and during spontaneous angina and two episodes of angina provoked by micturition. With the onset of chest pain, the heart rate increased slightly and the blood pressure rose 10 to 20 mm. Hg. A Valsalva maneuver, straining at stool, and smoking all showed normal responses. The electrocardiogram showed unequivocal signs during the periods of pain (fig. 1). Evaluation of the genitourinary system and hemodynamic studies were not obtained because of the patient's condition.

Ten days after the appearance of the above symptoms, and 5 days after the relationship was recognized, the patient experienced sudden chest pain and hemoptysis and died. Permission for a postmortem examination was denied.

Historical Aspects
The excellent clinical history provided by the patient, the electrocardiographic changes, and the response to nitroglycerin, both as prophylaxis and as treatment, established the diagnosis of angina pectoris. Medical historians have long recognized the pertinence of the observations of William Heberden and the now classic description of the anginal syndrome. However, "...inference or historical allusions to what we now know as angina pectoris or myocardial infarction" were well recorded for centuries prior to this. Lucius Annaeus Seneca (4 B.C.–65 A.D.),2 Theophile Bonet (1620–1689),3 Friedrich Hoffman (1753),4 the Earl of Clarendon (1632),5 John Baptist Morgagni (1771),6 and Nicholas Rougmon de Magny (1768)7 recorded these earlier descriptions, but they lacked the clarity, brevity, and pointenedness of Heberden's description, which was made by letter and in book-form in 1768 and 1772,8 respectively.

The historical background of the present case would seem to take root in one of these earlier "historical allusions," called to our attention by Dr. A. M. Master.9 The Earl of Clarendon (1609–1674),10 grandfather of two queens of England, recorded the events surrounding his father's death. "His Father had long suffered under an Indisposition (even before the Time his Son could remember) which gave him rather frequent Pains, then Sickness, and gave him Cause to be terrified with the Expectation of the Stone, without being exercised with the present Sense of it; but from the Time He was 60 years of Age, it increased very much, and four or five Years before his Death, with Circumstances scarce heard of before, and the Causes whereof are not yet understood by any Physician, He was very often, both in the Day and the Night, forced to make Water, seldom in any Quantity, but He could not retain it long enough, and in the Close of that Work, without any sharp Pain in those Parts, He was still and constantly seized on by so sharp a Pain in the left Arm, for Half a Quarter of an Hour, or near so much, that the Torment made him as pale (whereas He was otherwise of a very sanguine Complexion) as if He were dead; and He used to say, that He had passed the Pangs of Death: and He should die in one

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of those Fits,' as soon as it was over, which was quickly he was the cheerulest man liv-
ing. . ."

"Monday was Michaelmass Day, when in the Morning He went to visit his Brother, Sir Laurence Hyde, who was then making a Journey in the Service of the King, and from him went to Church to a Sermon where He found himself a little pressed as He used to be, and therefore thought fit to make what Haste He could to his House, and was no sooner come thither into a lower Room, than having made Water, and the Pain in his Arm, seizing upon Him, He fell down dead, with-
out the least motion of any limb. The sud-
dreness of it made it apprehend to be an Apoplexy, but there being no thing like Con-
vulsions or the least Distortion or alteration in the Visage, it is not like to be from that Cause nor would the Physician make any reasonable Guess from whence the mortal Blow proceeded."

The similarity to our case is striking, yet the topic to our knowledge has remained dome-
nant for 300 years. A search of the literature for the last several years has failed to reveal a record of a similar association between an-
ga and micturition. Friedberg does make the statement, however, that some patients experience numerous anginal seizures "after some slight activity or even after simple es-
tial physiologic functions."

In our endeavor to uncover this relation-
ship between angina and micturition, we cor-
responded with 24 prominent cardiologists as to their experience with such a relation-
ship. Dr. A. M. Master states that he has seen two similar patients. Dr. T. R. Harrison recalled that he may have seen a similar case 20 years ago. Dr. S. A. Levine stated that he has seen several patients with "angina after urination, but never as a major manifestation." Correspondence with the remainder of the cardiologists has failed to reveal any simi-
lar association.

Thus, after 300 years, we have been able to locate only 3 to 5 cases of angina pectoris precipitated by urination. In view of the eminence of the members of the medical pro-
fession since the time of Heberden who have concerned themselves with the topic of an-
ga, this must indeed be a rare association to have failed to reach clinical recognition, and in the words of the Earl of Clarendon, who so well first described this condition, "and the causes whereof are not yet under-
stood by any physician."

Physiologic and Clinical Considerations

The underlying cause of the aortic insuf-
fiency is uncertain. We attributed the angina to the presence of aortic insufficiency, but the possibility of coincident coronary artery nar-
rowing cannot be excluded.

Interest in this case lies primarily in the angina pectoris triggered by micturition. That this pain was specifically concerned with micturition was shown by the absence of the pain when the patient tried to void without any actual passage of urine, but was present when as little as 30 ml were voided.

Arterial hypotension, tachycardia, and arrhythmias were not caused by voiding. Direct increase in intra-abdominal pressure by straining at stool did not elicit the pain. Changes in posture and resulting alterations in the cardiac output have been mentioned as precipitating causes of angina; in this case posture showed no effect.

The amount of pressure required to initiate urination may have served as a trigger mech-
anism. However, the intravesicular pressure, which is developed during the strain of a Valsalva maneuver, far exceeds that necessary for opening of the detrusor muscle. There-
fore, intravesicular pressure alone was prob-
ably not the mechanism. Distention of the bladder as the etiologic stimulus would tend to be ruled out by the fact that voluntary restraint of urination with volumes as high as 500 ml. or as low as 30 ml. did not produce pain.

The physiology of micturition, as described by Emmett, involves a reflex arc under higher facilitory and inhibitory centers. The arc consists of sensory (afferent) and para-
sympathetic (efferent) fibers via the nervus erigens. The reflex center for micturition is
thought to be located in the sacral cord. The maintenance of the low intravesicular pressure, despite filling, is probably the result of the changing tone of the smooth muscles. Impulses from stretch receptors constantly reach the center in the sacral cord and would, through efferent parasympathetic fibers, cause contraction if they were not in turn inhibited by the centers in the cord or the brain stem, or both. The above is subconsciously controlled. When the volume or pressure is critical, however, it reaches consciousness and the higher center can inhibit micturition or facilitate the act.

In the present situation angina did not occur during the period of cortical inhibition, as the patient could voluntarily refrain from urination without pain. The angina was experienced with the onset or facilitation of micturition. This would imply that, if a neurogenic mechanism was operative, it would have to be related to that period when the higher center facilitated the local action at the center in the sacral cord. A suitable hypothesis would then be an overflow phenomena, perhaps mediated through the vagus, resulting in coronary artery constriction.

Angina is frequently triggered by particular actions; for example, shaving or the first morning walk, despite the fact that much more strenuous activity can be undertaken at another time, and it indeed approaches the situation of a "conditioned reflex." Emotion, despite absence of physiologically observed changes in blood pressure or heart rate, can also precipitate angina. If such an explanation is involved, the patient indeed had a unique conditioned reflex!

The actual means by which the act of micturition caused the angina is obscure. A few of the theoretic possibilities that might be pertinent and that would lend themselves to experimental observation, should a similar clinical case be encountered, seem worthy of mention. Distention of a hollow viscus has been shown to be a stimulus for coronary artery constriction.\textsuperscript{13, 14} The possibility of micturition causing a rise in pulmonary artery pressure\textsuperscript{15, 16} and with subsequent development of angina\textsuperscript{17, 18} also represents a possible mechanism.

Although not directly applicable to this case, the physiologic changes that occur with or following voiding in the "micturition syncope"\textsuperscript{19} syndrome should also be mentioned. This unique group of symptoms further substantiates the existence of as yet unknown influences between the cardiovascular and the genitourinary systems.

Summary

A case history of a 46-year-old Negro male was presented with rheumatic aortic insufficiency, angina pectoris, and possible subacute bacterial endocarditis. While hospitalized, the patient developed angina pectoris associated with micturition. This was not accompanied by a change in blood pressure, pulse, or increase in respiratory rate. The striking similarity to a description of a case approximately 300 years ago is pointed out and possible mechanisms of this association of angina and micturition are considered.

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Doctor and Patient

The relation of doctor and patient, from which medical science and practice arise, conditions everything within the field of medicine and is itself conditioned by the nature of human relations in general. The patient is a person who is anxious about himself, who asks another person to help him. The fact that the doctor-patient relation is a relation of persons provides certain principles in itself. Just as a teacher who teaches his subject and not his pupils is a bad teacher, so a doctor who sets out to heal diseases instead of helping people will not be a good doctor. The patient as a person requiring help is the focus of all problems in medicine. If medicine treats diseases, then a classification of diseases into bodily and mental will arise in which the unity of the person is lost sight of. Physicians and psychotherapists will have different objects to treat, and the necessity of co-operation in treating a patient who is always suffering in mind, whether or not he is suffering organically, will be lost sight of. Every case in which a doctor deals with arises because of the patient's anxiety about himself. His anxiety, which brings him to the doctor, is his sense that something is the matter with him. The task of the physician is to discover what is the matter. If some malfunctioning of the organism can be discovered, then it can be correlated with the anxiety of the patient about himself. If this is correct then the restoration of proper bodily functioning will remove this anxiety and bring the relation of doctor and patient to an end. But if the doctor can assure himself that there is no organic failure sufficient to account for the anxiety of the patient, what is to be done? The physician may feel inclined to say that there is nothing the matter with him. But there must be something the matter with a man who comes to a doctor when there is nothing the matter with him.

The anxiety must have a cause. As it is an anxiety about himself the cause must lie in himself. If it has no observable bodily correlate, the anxiety itself is a disease, and expresses the patient's sense that something is the matter with his functioning as a human being.—Professor John Macmurray (A Philosopher's View of Modern Psychology. Lancet, 1938). The Quiet Art: A Doctor's Anthology. Compiled by Dr. Robert Coope. Edinburgh & London, E. & S. Livingstone Ltd., 1952, p. 230.
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