THE RELATION OF AORTITIS TO SYPHILIS,
AND THE IMPORTANCE OF ITS
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It is not quite ten years since Chiari,¹ Marchand² and others described a condition found post mortem in the aorta which they named mesaortitis. They pointed out the frequency with which this condition was associated with manifestations of syphilis or with a definite history of the disease. Chiari found that a large proportion of paretics showed this affection and Marchand pointed out its constant association with aneurysm of the aorta. Their conclusions gained support from the work of Schmori,³ Wright and Richardson,⁴ and others who from 1907 to 1909 reported the presence of spiral organisms morphologically similar to the *Spirochæta pallida* in aortas showing mesaortitis. Since then, these observations have been confirmed by numerous workers. The association of mesaortitis with the other signs of syphilis and the finding of the *Spirochæta pallida* in the lesions have given this condition definite recognition as a result of syphilitic infection.

As viewed at autopsy, this syphilitic involvement of the aorta has several striking characteristics. It usually occurs at the root, sometimes extending not more than 5 cm. above the aortic valves, although a large part of the arch may be affected. The aorta is thickened in patches, shows pitting and scarring in places, perhaps small aneurysmal dilatations. Calcification is rare, but there is usually an elastic rubbery thickening. This thickening extends even to the valves. Microscopically, it is found that there is a primary necrosis of the media and probably of the intima with development of the reparative connective-tissue. The spirochetes are found in the media and the intima in and about the necrotic areas. The process is a chronic one and is usually a late manifestation of the disease. The demarcation of this form of arterial disease from the general class of arteriosclerosis has led to an increased interest in the syphilitic affections of the heart and aorta, and it is now well recognized that the involvement of the aortic cusps in syphilitic mesaortitis is very common. Wright found an involvement of these valves in all cases in which spirochetes were found in the aorta. Longcope⁵ found that mesaortitis was associated with 81.5 per cent. of eighteen cases in which there was pure aortic valvular disease, that is, disease of this valve uncombined with that of the other valves.

While clinical observation cannot in any way take the place of pathologic study, a great many interesting facts have been brought out since the introduction of the x-ray and the Wassermann reaction as adjuncts to the study of diseases of the circulatory system. Longcope gives the results of observations by himself and seven-teen other writers, showing that out of a total of 182

cases of heart-disease in which the aortic valve was involved, 135, or 74.1 per cent., gave strongly positive Wassermann reactions. Three of Longcope's cases came to autopsy and in all three, typical syphilitic aortitis was found associated with the disease of the aortic valves, and in all spirochetes were found in the aorta.

This report is written for the purpose of enumerating additional cases of aortic disease which have been studied clinically with the aid of serologic and x-ray examination. It seems to us important that if aortitis does occur with some degree of frequency as a late visceral complication of syphilis, this fact should be recognized. Moreover, if it is shown that antisiphilitic treatment can be administered with benefit in an early case of syphilitic aortitis, the early diagnosis of aortitis and, especially, the recognition of the etiologic factor become of the utmost importance to the clinician.

The series embraces the statistics of thirty-six cases of aortic disease which have come under our observation. By aortic disease we mean involvement of the aorta or the aortic valves, singly or in combination. Included in this number are three cases in which there was a complicating mitral lesion. Only cases in which the anatomic diagnosis could be made with positive certainty, either by physical signs or by the x-ray examination, have been included. Of this series, twenty-seven (75 per cent.) showed positive Wassermann reactions. The proportion is almost identical with that which Longcope reports in his collected cases. When it is remembered that a negative Wassermann reaction cannot be interpreted as evidence against an old luetic infection, it is apparent that the actual proportion of cases with a luetic basis is undoubtedly greater than our figures would represent. An analysis of the group showing positive Wassermann reactions, which we think fair to call cases of syphilitic aortic disease, should be profitable.

In our series, the occurrence among men was much more frequent than among women. Of the total of twenty-seven, nineteen (70.3 per cent.) were men. This suggests the possibility that the conjunction of hard physical labor with syphilis determined the aortic location. Some support is lent to this supposition by the fact that the majority of the men were or had been engaged in hard labor, as day-laborers, puddlers, masons, bricklayers, hod-carriers, etc.

The ages of the twenty-seven patients ranged from 29 to 64, but the great majority (twenty-three patients, 85.1 per cent.) were between the ages of 35 and 55.

Ages	No. of Cases
Between 25 and 29.....	1
Between 30 and 34.....	1
Between 35 and 39.....	4
Between 40 and 44.....	6
Between 45 and 49.....	5
Between 50 and 54.....	7
Between 55 and 59.....	2
Between 60 and 64.....	1
Total.....	27

The late incidence of this manifestation may be understood when we turn to the patients' accounts of infection and find that of the twelve patients who were able or were willing to give an adequate history, the average number of years since the appearance of the chancre was about seventeen (17.2). The actual numbers ranged from eleven to "many over twenty-five." It is evident, then, that this process is distinctly a late one.

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* From the Department of Medicine of Western Reserve University.

* The serologic portion of this report is from the H. K. Cushing Laboratory of Experimental Medicine of Western Reserve University.

1. Chiari: Verhandl. d. deutsch. path. Gesellsch., 1903, p. 137.

2. Marchand: Verhandl. d. deutsch. path. Gesellsch., 1903, p. 197.

3. Schmori: München. med. Wchnschr., 1907, H. 188.

4. Wright and Richardson: Boston Med. and Surg. Jour., 1909, cix, 539.

5. Longcope: Bull. Ayer Clinical Laboratory, 1910, No. 6, p. 60.

A significant fact in regard to these cases is the long period of latency. In only three of the entire twenty-seven was a definite account of the amount or nature of previous treatment to be secured. Two men had had treatment for one month each; one man had taken one and one-half years of treatment. Apparently none of the twenty-seven cases, except three with cerebrospinal involvement had shown any obvious or troublesome signs of lues between the disappearance of the early signs and the oncoming of aortic disease during the lapse of an average of seventeen years.

Another important fact is the concomitant occurrence of cerebrospinal syphilis in one case and of tabes dorsalis in two. One of the patients, a woman (B. S.), aged 38, presenting both aortic disease and tabes dorsalis, showed the stigmata of congenital lues.

The symptoms of aortitis are usually indefinite and for that reason frequently are passed over as of little moment. Pain referred to the region of the upper sternum is often the first symptom. The pain may be slight and inconstant, is usually brought on by exertion, and becomes more intense as time goes on until it has all the characteristics of angina pectoris. Pain was a prominent early symptom in eighteen (66 per cent.) of our twenty-seven syphilitic cases. At times the patients complain of a sense of constriction as if they had a belt drawn tightly about the upper part of the chest, until they feel as if they would strangle to death. Dyspnea on exertion often occurs early. It is not infrequently paroxysmal in character, the patients complaining simply of "asthmatic attacks," which come on after slight exertion or after trifling excitement. One of our patients was perfectly comfortable while at rest, but the least effort brought on an attack of choking, which made housework impossible. It is interesting to note that though this patient could walk without much trouble, sweeping at once brought on an attack. At times the dyspnea is associated with fainting spells. A dry, irritating, non-productive cough is fairly common, especially after the dilatation of the aorta has become well marked. Palpitation of the heart is rare as an early symptom. It occurred in but one of our cases.

Early aortitis gives but meager physical signs. By the time the symptoms have become severe enough to cause the patient to seek medical advice, physical examination will usually reveal the presence of a varying amount of dulness in the second intercostal spaces to the right and left of the sternum. This increased dulness was noted in seventeen of our twenty-seven cases. Often this is the only sign, though it may be accompanied by a diastolic impact which is palpable over the upper sternum. Even in the early cases it is usual to hear diastolic murmurs along the left border of the sternum referable to the aortic valve, and when the process has become well established, systolic and diastolic murmurs originating at the aortic orifice are common. Such murmurs were heard in nineteen of our series. The tracheal tug is not usually demonstrable early in the condition, unless there is extensive involvement of the arch of the aorta. This sign was noted in five of the twenty-seven cases. Visible pulsations, just to the right or to the left of the sternum in the second intercostal space, occur late in the course of the disease. Only seven of our cases showed visible pulsations in this region.

This brief review will suffice to indicate that the symptoms and signs of early aortitis are extremely slight, and are of a nature to render early recognition

difficult. We have found the method of direct percussion of the area of the aorta to be of the greatest value in detecting a slight increase in dulness to right and left of the sternum. It is important to remember that the physical signs may vary early in the condition, being well marked shortly after exertion or excitement and disappearing again during rest.

The x-ray plate served to verify the results of physical examination, and it seems almost indispensable in early lesions in which it would be unreasonable to expect striking signs. A properly prepared photograph gives a definite and convincing picture, if there is dilatation of the aorta.

The nine patients who had aortic disease with negative Wassermann reactions deserve attention. Three gave definite histories of rheumatism. Another, who showed unmistakable signs of a well-marked aneurysmal dilatation of the transverse arch, stated that the symptoms of pain and shortness of breath had followed a severe blow on the sternum due to a fall about three years before observation.

One case is of such interest as to warrant a detailed account.

CASE 1.—Mrs. F. C., aged 30, brought her daughter, aged 10, to the children's clinic at the Lakeside Hospital Dispensary. The child showed definite stigmata of congenital lues, and both mother and daughter gave strongly positive Wassermann reactions. The mother admitted a luetic infection shortly before the birth of her child. At the time of examination the mother appeared to be in excellent health. About six months later, she returned to the dispensary complaining that for a month she had been getting short of breath on exertion and that recently she could not do her housework on account of a sense of oppression under the upper part of the sternum which came on as soon as she began to sweep or dust. She was pale and manifestly in distress. The heart was enlarged slightly to the left and there seemed to be a slight increase in dulness to the left and to the right of the upper part of the sternum. There was a slight though definite diastolic impact over the manubrium, and a very faint diastolic murmur was heard along the left border of the sternum. The patient was admitted to the wards of the hospital where an x-ray was taken after a rest in bed of twenty-four hours. This, it is interesting to note, showed no dilatation of the aorta. While in the hospital she had several attacks resembling those of angina pectoris. The dispensary physical findings were confirmed. Two days after her admission, the patient sat up in bed and died. The presumptive diagnosis here is an early syphilitic involvement of the root of the aorta. Whether the death was due to coronary interference or vagus involvement is a matter of pure speculation. The case is interesting because of the early date at which the signs and symptoms were observed and because the previous observations settled the diagnosis of latent syphilis.

CASE 2.—Another case, which is of more practical importance and is worthy of a report in some detail, was seen in the dispensary at Lakeside Hospital. The patient, F. K., a man, showing signs of a dilated aorta and aortic insufficiency, which were definite clinically and were confirmed by the x-ray, admitted lues and showed a strongly positive Wassermann reaction. His complaint was of substernal distress and pain of two months' duration. He was given antiluetic treatment, and the response to it was so prompt that at the end of the first week he had no pain and little distress and when last seen was practically free from his symptoms.

Alleviation of pain by mercurial treatment was noted with other patients. The improvement was especially marked with one (J. P.). In this instance, inunctions were used with great relief.

These cases raise the question as to the utility of specific treatment after a luetic mesaortitis has pro-

CASES IN WHICH AORTA OR AORTIC VALVES, OR BOTH, WERE AFFECTED

No.	Initials	Hosp.*	Sex	Age	Years Since Infection	Rheumatism	Cardinal Complaint	X-Ray†	Wass.‡	Diagnosis	Remarks
1,386	M. L.	L. H. D.	M.	27	Denied.	None.	Pain in heart.	+	—	Aortic regurgitation and dilated arch.	Aortic dulness increased; heart enlarged; right radial > left.
1,053	L. R.	L. H. D.	F.	58	Denied.	None.	Pain in throat.	0	+++	Dilated aorta.	Double aortic murmur; heart enlarged to left.
1,117	R. D.	L. H. D.	F.	55	Indefinite.	None.	None.	0	+++	Aortic regurgitation.	
1,031	B. S.	L. H. D.	F.	38	Congen.	None.	Pain in legs.	+	+++	Dilated aorta and tabs.	
826	P. F.	L. H. D.	M.	50	19	None.	Cough.	0	+++	Dilated aorta.	Tracheal tug; pulsation 2 space rt. of sternum; aortic dulness increased.
714	M. K.	L. H. D.	M.	42	Denied.	None.	Pain in side; cough.	—	—		
701	A. C.	L. H. D.	F.	53	Many.	None.	Pain to shoulder-blade.	+	+++	Aortic stenosis and regurgitation.	
352	R. A.	L. H. D.	M.	29	13	Subacute.	Pain in chest and dyspnea.	0	+++	Dilated aorta and aortic regurgitation.	No signs of dilated aorta.
144	P. M.	L. H. D.	M.	38	Denied.	20 years before.	Palpitation and dyspnea.	0	—	Aortic stenosis and regurgitation.	
64	J. P.	L. H. D.	M.	50	Denied.	None.	Pain in side.	+	+	Aortic regurgitation.	
29	J. M.	L. H. D.	M.	26	Denied.	None.	Dyspnea on exertion.	—	—	Dilated aorta and aortic regurgitation.	
54	A. L.	L. H. D.	F.	65	Denied.	Not noted.	Pain in sternum.	+	—	Aortic regurgitation.	
368	J. L.	L. H.	M.	37	22	Yes.	Pain and dyspnea.	0	+++	Aneurysm arch of aorta.	Visibly pulsating tumor, 2d lt. I. S.; tracheal tug; symptoms followed fall three years ago.
609	E. F.	L. H.	F.	43	Indefinite.	None.	Dyspnea; pain in heart.	+	+++	Dilatation of arch of aorta.	Also pericarditis, chronic nephritis, edema; autopsy.
373	C. H.	L. H.	M.	49	Denied.	Yes.	Dyspnea.	0	+++	Aneurysm and transverse arch.	Also aortic regurgitation.
318	A. B.	L. H.	M.	53	Denied.	None.	Precordial pain and dyspnea.	+	—	Dilated arch; aortic regurgitation.	Aortic systolic murmur and thrill; diastolic aortic murmur.
414	A. S.	L. H.	M.	49	Denied.	None.	Epigastric pain and dyspnea.	0	+++	Aortitis and dilatation aortic and mitr. regurg.	Left pupil > right; marked dilatation of aorta; diastolic impact and murmur.
78	S. S.	L. H.	M.	46	Denied.	21 years before.	Dyspnea and cardiac pain.	0	+++	Mitral and aortic regurgitation.	Heart enlarged; aortic dulness increased.
208	J. Z.	L. H.	M.	38	20	None.	Pain in heart and left arm.	0	+++	Aortic regurgitation; dilatation of aorta.	
115	G. B.	L. H.	M.	51	Many over 25	None.	Periodic dyspnea.	+	+++	Aortic regurg.; luecic aortitis.	Autopsy.
186	A. W.	L. H.	F.	30	Denied.	6 years before.	Dyspnea.	0	—	Aortic aneurysm and regurgitation.	Signs of dilated aorta slight; definite signs of valvular involvement.
1,005	J. C.	L. H.	M.	53	Denied.	24 years before.	Dyspnea; recent pain in left side.	0	+++	Aortic and mitr. regurg.; angina pectoris.	No increase in aortic dulness; blood-pressure 240 mm. Hg.
1,476	C. F.	L. H.	M.	43	20	None.	Precordial pain and dyspnea.	+	+++	Aneurysm of aorta.	Also cerebrospinal lues.
1,959	S. L.	L. H.	M.	53	12	None.	Cough and pain in chest.	+	+++	Aortic regurg. and stenosis; dilated aorta.	Aortic dilatation slight.
2,170	D. C.	L. H.	M.	43	23	Twice.	Pain in chest and epigastrium; dyspnea.	+	+++	Aneurysm of aorta.	Also tabes dorsalis.
1,576	J. R.	L. H. D.	M.	64	20	None.	Pain in chest.	+	+	Aortic regurgitation.	
1,854	F. K.	L. H. D.	M.	39	16	None.	Pain in chest.	+	+++	Aortic regurgitation.	
2,265	E. M.	L. H.	M.	41	Denied.	Yes.	Dyspnea and cough.	+	+++	Aortitis; aortic and mitral regurgitation.	
2,290	S. L.	L. H.	F.	36	Denied.	5 years before.	Fainting spells.	—	—	Aortic stenosis; regurgitation.	
1,564	M. T.	L. H.	F.	60	No history.	None.	Dyspnea.	+	—	Aortitis.	Tenderness over precordium; diastolic murmur in 2 R.I.S.
2,213	N. F.	L. H.	F.	42	Denied.	4 years before.	Pain in stomach; dyspnea; palpitation.	+	+++	Aneurysm of aorta.	
471	J. P.	†	M.	50	17	None.	Pain and shortness of breath.	0	++	Luecic aortitis.	R. and L. dilatation over aorta; syst. thrill and murmur over aorta; marked imp. with treatment.
953	C.	M. H.	M.	48	14	None.	Palpitation.	0	+++	Aneurysm of aorta.	Marked dilatation of aorta and heart.
371	T.	C. H.	M.	42	Denied.	None.	Paroxysmal dyspnea.	+	+++	Aneurysm of aorta.	
242	Mrs. F. C.	L. H.	F.	32	11	Not noted.	Pain and cough.	—	+++	Aortitis.	Child, aged 10 years; has cong. lues; patient died suddenly; no autopsy.
1,912	E. T.	L. H.	F.	48	Denied.	None.	Dyspnea.	+	+++	Dilatation aorta; aortic stenosis and regurg.	

* Initials in this column stand for the following institutions: L. H. D., Dispensary of Lakeside Hospital and Western Reserve University; L. H., wards of the Lakeside Hospital, Cleveland; M. H., Marine Hospital, Cleveland; C. H., City Hospital, Cleveland. † Case of Dr. A. S. Maschke, to whom we are indebted for the privilege of reporting it. ‡ In these columns the plus sign (+) means positive findings; the minus sign (—), negative findings; a zero (0) shows that no x-ray was taken.

gressed to such a point as to make it recognizable. The question is most important, but aside from the case mentioned, it is impossible for us to speak from experience. In these cases, particularly those in which a positive Wassermann reaction exists and in which the symptoms are of short duration, it would seem that antisyphilitic treatment should be administered vigorously. For although one cannot expect to repair the destruction that has already taken place, there is a hope in every case of this kind of arresting the process, which if left alone will lead in all probability to actual aneurysm-formation with all its distressing features.

SUMMARY

From the cases reported by others and the work done on them, together with the material on which this paper is based, the following conclusions seem justifiable:

1. A large proportion (70-75 per cent.) of lesions of the aorta or aortic valve are syphilitic in origin.

2. Syphilitic aortitis is a definite pathologic and clinical manifestation of syphilis, usually coming late after the disappearance of the early manifestations following a long period of latency.

3. Aortitis occasionally is associated with luetic cerebrospinal manifestations.

4. A complaint of pain in the chest and dyspnea should lead to careful examination of the thorax, especially in the region of the aorta. In case of suggestive or doubtful physical findings, an *x-ray* examination is desirable.

5. After a diagnosis of aortitis has been made, a Wassermann reaction should be performed. A positive reaction indicates the desirability of urgent mercurial treatment.

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ABSTRACT OF DISCUSSION

DR. DELANCEY ROCHESTER, Buffalo, N. Y.: In the hospital in Buffalo we have had a number of cases of aortitis and cardiosclerosis; we have taken pains in every case to have the Wassermann reaction instituted. Unfortunately, I am not prepared to give the actual percentage of cases now; but a large number gave the positive Wassermann test. The cases that responded to the Wassermann reaction improved under the hypodermic administration of mercury together with a certain amount of rest.

DR. NATHANIEL BOWDITCH POTTER, New York: At the City Hospital in New York City, Dr. Harlow Brooks has been giving salvarsan to a number of selected patients of the kind under discussion. Two patients on whom mercury had no effect whatever in relieving pain and the symptoms of broken compensation were very much improved by the use of salvarsan. The dose was small and was repeated only three or four times.

I think that this is a very important point—that in a case of aortic involvement, even with no definite history of syphilis, antisyphilitic treatment should be employed. Such a patient has been under my observation for a number of years, and he had a definite history of an attack of acute articular rheumatism; but it was not until the Wassermann reaction, which should be used as a routine procedure, gave a positive result that under the use of mercury the patient rapidly improved.

DR. HENRY KENNON DUNHAM, Cincinnati: There is one point which I think is slightly misleading: the possibility of diagnosing these early aortic lesions, even to a limited extent, by means of percussion. Only 44 per cent. of 100 patients examined by *x-ray* and percussion were demonstrable by percussion. Enlargement to the right is more difficult to detect than enlargement to the left. I think, however, that this is

rather a low percentage, because many patients examined were tuberculous.

DR. LOUIS FAUGERES BISHOP, New York: There is a certain point in the *x-ray* examination of these cases of aortitis that one should always keep in mind, the dilatation of the aorta which is dependent on increased blood-pressure. I have spent two summers in Nauheim working with one of the best *x-ray* men in the world who makes a specialty of *x-ray* work on the chest. We found that this knuckle or dilatation of the aorta to the left of the clavicle showed up in those patients who had a high blood-pressure. All patients are *x-rayed* and in many instances aneurysms are present. There is no doubt but that with this increase in the blood-pressure, there must be an increase in the distention of the aorta. This condition is not very difficult to diagnose and, even when the Wassermann reaction has not been sought for, under treatment these patients improve greatly.

DR. ARTHUR D. DUNN, Omaha, Neb.: One point should be emphasized more; practically all cases of angina vera in men under 50 are due to an involvement of the coronary arteries by syphilitic disease. In one case of syphilitic aortitis I was misled by a negative Wassermann reaction; the case came to autopsy and spirochetes were found in the aorta. Syphilitic involvement of the myocardium with or without aortitis should be emphasized. I have now under observation three cases of myocarditis. These patients were under control and in the hospital for a considerable length of time (one to two months), so that improvement due to rest, etc., could be excluded. The patients, all under 50 years of age, denied syphilis, and there was nothing to show that syphilis had ever existed. The Wassermann reaction was positive. In two salvarsan was given with marked improvement in the condition; in the other case there was no improvement. Tabes and paresis are often associated with aortic insufficiency and aortic syphilis. The attention of surgeons should be called to this well-known fact. I have in mind a patient operated on in Philadelphia, who came to me a few months later for cardiac decompensation due to a syphilitic aortitis and valvulitis. He had been operated on for gastric crises.

DR. WALTER L. BIERRING, Des Moines, Iowa: Since *x-ray* pictures are taken of patients in the upright position at a distance of from 3 to 6 feet, the heart form and connecting large vessels are brought out more distinctly. In this position, the form of the heart is elongated and the curves produced by the large vessels are also outlined more definitely. In observing these pictures I have often been confused by the sharp curve which the aorta makes as it turns upward and backward forming a distinct bulging very suggestive of a dilated aorta or a beginning aneurysm. In connection with this work a large number of healthy young men, resident physicians and others, were examined. In every instance the blood-pressure was normal, and a previous luetic infection was definitely excluded. While I recognize that the *x-ray* is very helpful in recognizing early changes in the aorta, I feel that great care should be exercised in properly interpreting the normal curves that are seen in the *x-ray* picture.

DR. RICHARD DEXTER, Cleveland: I believe that the *x-ray* should always be used in the early diagnosis of aortitis. Among the early signs of this disease are shortness of breath on the slightest exertion, with pain, referred to the upper chest. There is also a sense of constriction high up in the chest. The use of *x-rays* in these conditions is of great help and will often bring out the condition when the signs fail us. I agree that the bulging to the left is often found in normal cases. When I first became interested in this class of cases, I found many with but a moderate increase of dullness over the aorta, but I found that this occurred in almost every case. I think that all roentgenologists recognize the possibilities of error in *x-ray* work. A combination of signs and of symptoms, together with the use of *x-rays*, seem to be the most effective in making a diagnosis of this condition. The Wassermann reaction is an indication for intensive treatment, and it also has its diagnostic importance. When positive it shows that we have to deal with a luetic aortitis.