PANAORTITIS

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The problem concerning the identification of inflammatory diseases of the aorta is becoming increasingly more complex. This is caused, in part, by the recognition of newer forms of aortitis, and by the realization that the aorta may be affected in certain widespread arterial or systemic disorders. Sufficient anatomic and clinical similarities exist among the various types of aortitis to render diagnosis difficult for the pathologist as well as for the clinician.

The pathogenesis of syphilitic aortitis has been recognized for decades,[1] and its pathologic features are well documented.[2–4] Although declining in incidence,[5] it still accounts for the greatest single group of inflammatory aortic lesions.[6] The lesions of rheumatic aortitis, first described by Klotz,[7,8] were studied intensively and emphasized by Pappenheimer and von Glahn.[9–11] Gross [12] stressed the association of pulmonary arteritis as well as aortitis with rheumatic fever. Sandison [13] pointed out that the entire length of the aorta might be affected in rheumatic aortitis.

Mallory [14] is credited with the description of the first two cases of that particular form of aortitis and aortic insufficiency which occurs in rheumatoid disease. However, the peculiar association of aortitis with rheumatoid spondylitis was first pointed out by Bauer, Clark and Kulka.[15] These same authors [16] collected 22 examples of this lesion over a 20-year period. Many reports and reviews of this disease, which clinically and pathologically closely resembles syphilitic aortitis and endocarditis, have since appeared.[17–28]

McGuire, Scott and Gall [29] reported 5 cases of severe aortic insufficiency with aortitis confined to the thoracic aorta. Syphilis was ruled out as a cause in each instance. The cases bore striking resemblance to those of rheumatoid aortitis, but none of the patients had peripheral

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or vertebral joint disease. A different, but unknown, etiologic agent was postulated.

One of the more interesting and intriguing causes of the aortic arch syndrome[30] is the disease described by the Japanese ophthalmologist Takayasu in 1908.[31] Classically, this is a chronic sclerosing panarteritis of young women, involving the aortic arch or the proximal segments of its brachiocephalic branches. The condition has been variously referred to as "pulseless disease" or Takayasu's disease. Several comprehensive surveys exist,[30-35] its association with hypertension has been considered,[36] and cases are being recorded in many parts of the world.[37-44]

Ten unusual cases of nonsyphilitic aortitis are the basis of this report. Five of these had historical and anatomic evidence of the rheumatic-rheumatoid diseases and 5 did not. All of the cases have a number of common morphologic features which tend to unite them as a group and to distinguish them from other types of aortitis, particularly from luetic aortitis and the aortitis of pulseless disease.

Material and Methods

The cases described in this paper were encountered in the necropsy services of the Kings County Hospital Center (cases 1, 2, 6 and 7), the Long Island College Hospital (cases 3, 8, 9 and 10) and the Medical College of Virginia (cases 4 and 5). They were selected from a total of approximately 11,500 necropsy examinations. Cases 4 and 5 have been published elsewhere in greater clinical detail.[22,23] After dissection, gross photography and removal of tissue blocks, the entire heart and aorta were preserved in cases 1, 2, 4, 5, 6, and 7. Blocks of the abdominal aorta were not available for study in cases 3, 8, 9 and 10.

A variety of staining techniques including the Masson trichrome, Verhoeff-van Gieson elastic tissue, Weigert fibrin, periodic acid-Schiff, mucicarmine and alcian blue, as well as hematoxylin and eosin stains were prepared in all cases. Levaditi or Warthin-Starry stains for spirochetes were carried out in each instance. Gram, acid-fast and the Gridley stains for fungi were employed in selected cases.

A comparable group of 85 cases of syphilitic aortitis from the necropsy files of the Kings County Hospital Center was also examined. Tissues from 2 examples of pulseless disease were also available for comparison, one from the Armed Forces Institute of Pathology, Washington, D.C., and one from the Veterans Administration Hospital, Brooklyn, New York.

Results

The main features of the cases are summarized in Tables I and II. The ages of the patients ranged from 11 to 72 years. The group was comprised of 6 males and 4 females. Six were Caucasian and 4 were Negro.

An attempt was made to exclude syphilis as an etiologic factor in each instance. Nothing in the histories suggested lues, and apart from the aortitis and aortic regurgitation, there were no clinical or pathologic stigmas that could be attributed to the disorder. Serologic tests for syphilis were negative in 9 patients and in 1 (case 1), an 11-year-old boy with

acute rheumatic fever, the serologic test was not performed. *Treponema pallidum* immobilization procedures were not done. Spirochetes could not be demonstrated in tissue sections of the aortas.

On gross examination, the presence of aortitis and aortic valvular endocarditis with aortic insufficiency was readily recognized in 4 cases (cases 4, 5, 6 and 7). In each of these the lesions closely paralleled those seen in classical syphilitic aortitis with aortic valvulitis. The aortic walls were appreciably thickened, and the intimal surfaces displayed numerous wrinkles and ridges disposed in longitudinal, transverse and stellate arrays interspersed with raised grayish white plaques. Fibrous thickening, rolling and shortening of the valve cusps, with distortion of the commissures, accompanied aortic annular dilatation in each instance (Figs. 1, 3 and 5). Three of the cases (cases 4, 5 and 6) exhibited moderate dilatation of the thoracic portions, and in one (case 6) a saccular aneurysm of the ascending arch, measuring 1.7 by 2 by 2.5 cm., had ruptured into the pericardial sac (Fig. 3). The process not only involved the supravalvular and thoracic portions but in all 4 instances extended into the abdominal segments of the aortas. A distinctive feature in 3 of the cases (cases 4, 6 and 7) was the segmental distribution of the process, with the occurrence of sharply demarcated "skip areas," bordering which the aortic involvement ceased abruptly (Figs. 2, 4 and 6).

An aortitis of segmental character involving both thoracic and abdominal segments of the vessel was also observed grossly in another case (case 2). In this instance, however, the aortic valve was not insufficient but exhibited a rather well-marked calcific aortic stenosis. Minimal stenosis of the mitral orifice was also found.

In the remaining cases (cases 1, 3, 8, 9 and 10) aortitis was not suspected grossly, which is noteworthy in view of the rather striking histologic changes observed later. These cases simply showed atherosclerosis of slight to marked extent which may possibly have obscured the underlying inflammatory processes. One patient (case 1), a child with acute rheumatic pancarditis, had combined aortic and mitral insufficiency of mild degree, but only a few scattered atheromas were noted grossly in the aorta. In another case (case 3) there was a tight mitral stenosis, the aortic cusps were delicate and the valve was competent. Absence of significant aortic valvular involvement may have failed to attract a more detailed gross inspection of these aortas.

In none of the 10 aortas were the ostiums of the thoracic or abdominal branches significantly narrowed or impinged upon by either the inflammatory or atherosclerotic process. In one instance (case 4) the right coronary orifice was pulled upwards and slightly distorted, and in an-

TABLE I

MAJOR FEATURES IN 10 CASES OF PANAORTITIS

Case no.	Age (yr.) and sex	History of rheumatic disease	Anatomic evidence of rheumatic disease *	History or stigmas of syphilis	Serologic test for syphilis	Intimal inflammation	Microabscesses or fibrinoid necrosis	Involvement of abdominal aorta	Segmental distribution with skip areas	Aortic insufficiency	Associated pulmonary arteritis
1	11 M	Rheumatic fever	Acute rheumatic pancarditis	None	Not done	Present	Present	Present	Absent	Present	Present
2	72 F	Joint pain	Chronic rheumatic valvular disease	None	Negative	Present	Present	Present	Present	Absent	Present
3	40 F	Chorea	Chronic rheumatic valvular disease	None	Negative	Present	Present	? †	Absent	Absent	Present
4	54 M	Rheumatoid arthritis	Rheumatoid spondylitis	None	Negative	Present	Present	Present	Present	Present	Present
5	50 M	Rheumatoid arthritis	Rheumatoid spondylitis	None	Negative	Present	Present	Absent	Absent	Present	Present
6	25 F	Absent	Absent	None	Negative	Present	Present	Present	Present	Present	Present
7	13 M	Absent	Absent	None	Negative	Present	Present	Present	Present	Present	Present
8	61 F	Absent	Absent	None	Negative	Present	Absent	? †	Absent	Absent	Absent
9	63 M	Absent	Absent	None	Negative	Present	Present	? †	Absent	Absent	Absent
10	51 M	Absent	Absent	None	Negative	Present	Present	? †	Absent	Absent	Absent

* Other than aortitis and aortic insufficiency.

† Sections of abdominal aorta were not available for study in cases 3, 8, 9 and 10.

TABLE II

ADDITIONAL DATA IN 10 CASES OF PANAORTITIS

Case no.	Clinical features	Anatomic diagnoses
1	Several prolonged admissions for rheumatic heart disease following rheumatic fever. Terminal febrile course with heart failure.	Rheumatic heart disease, active, with acute pancarditis; mitral and aortic insufficiency, mild; left ventricular hypertrophy and dilatation (heart, 360 gm.); panaortitis and pulmonary arteritis.
2	Angina, exertional dyspnea and ankle edema for 6 years. Intermittent joint pains. Terminal congestive heart failure.	Rheumatic heart disease, inactive, with mitral and aortic stenosis, moderate; left ventricular hypertrophy and dilatation (heart, 430 gm.); panaortitis and pulmonary arteritis; coronary atherosclerosis, marked; cholelithiasis.
3	Chorea in childhood. Heart failure due to mitral stenosis during 14th pregnancy. Compensated for 6 years. Terminal febrile course with cardiac decompensation and atrial fibrillation.	Rheumatic heart disease, inactive, with mitral stenosis, marked; left atrial hypertrophy and dilatation (heart, 350 gm.); mural thrombus, left atrium; multiple pulmonary emboli; panaortitis and pulmonary arteritis; subacute bacterial endocarditis, mitral valve; acute purulent leptomeningitis.
4	Progressively worsening heart failure with aortic regurgitation for 3 years. Pain in chest, back and large joints. Conjunctivitis and nonspecific urethritis.	Rheumatoid spondylitis; peripheral rheumatoid arthritis; panaortitis with aortic insufficiency, severe; pulmonary arteritis; chronic fibrous pericarditis; left ventricular hypertrophy and dilatation (heart, 650 gm.); Reiter's disease.
5	20-year history of arthritis with ankylosis of all peripheral joints and spine. Heart failure with arrhythmia and aortic regurgitation.	Rheumatoid spondylitis; peripheral rheumatoid arthritis; panaortitis with aortic insufficiency, severe; pulmonary arteritis; left ventricular hypertrophy and dilatation (heart, 550 gm.).
6	Treated for active pulmonary tuberculosis intermittently for 5 years. Cardiomegaly and aortic incompetence discovered on latter admissions. Expired suddenly and unexpectedly.	Panaortitis with aortic insufficiency, moderate; ruptured saccular aneurysm of ascending aorta; hemopericardium; pulmonary arteritis; left ventricular hypertrophy and dilatation (heart, 360 gm.); fibrocaseous pulmonary tuberculosis, active, bilateral.
7	One-week history of sore throat, hemoptysis and exertional dyspnea. Expired 8 weeks later with progressively worsening aortic regurgitation.	Panaortitis with aortic insufficiency, severe; pulmonary arteritis; left ventricular hypertrophy and dilatation (heart, 360 gm.); acute bronchopneumonia.
8	Sudden onset of headache followed by coma and death one day later. Bloody spinal fluid.	Spontaneous subarachnoid hemorrhage, massive, recent; panaortitis; fatty infiltration of myocardium (heart, 320 gm.).
9	Long history of obstructive uropathy. Carcinoma of the prostate. Remote right nephrectomy following back injury. Mild hypertension. Terminal febrile course with anuria and azotemia.	Acute and chronic pyelonephritis with perinephric abscess, left; adenocarcinoma of prostate; panaortitis; coronary atherosclerosis, moderate; left ventricular hypertrophy (heart, 450 gm.); nutritional cirrhosis; acute bronchopneumonia.
10	Long history of obstructive uropathy. Benign prostatic hyperplasia. Persistent hypertension with heart failure and azotemia.	Subacute glomerulonephritis; chronic pyelonephritis; polycystic kidneys; occult carcinoma of prostate; panaortitis; left ventricular hypertrophy (heart, 980 gm.); fatty metamorphosis of liver; acute bronchopneumonia.

other (case 6) both coronary ostiums were similarly affected. In the latter case the left coronary artery had a dual orifice, the anterior descending and circumflex branches arising separately from the sinus of Valsalva. No thrombi, mural or occlusive, were found in the aortas or any of the major branches.

Histologically, all of the cases bore, to a greater or lesser degree, some resemblance to the microscopic alterations seen in syphilitic aortitis. However, several characteristic features not seen in lues were found consistently. Dense adventitial fibrosis and inflammation were universally present. The inflammatory cells were chiefly lymphocytes and a few histiocytes. Plasma cells were rare or absent. The inflammatory cells were disposed in perivascular fashion about the vasa vasorum as well as in sheets and bands throughout the adventitial tissues. In 3 cases (cases 4, 5 and 7) the vasa vasorum showed severe endarteritis obliterans. In the other cases (with the exception of case 1) the vasa exhibited varying degrees of arteriosclerosis.

The inflammatory changes in the intima and media were of a different nature. The ubiquitous presence of an acute necrotizing intimitis was a feature peculiar to these cases (Figs. 7 and 8). Linear bands of neutrophils and mononuclear cells infiltrated the subendothelial tissues, and, in the majority of instances, resulted in zones of focal necrosis or so-called microabscesses (Fig. 9). Foci of fibrinoid necrosis were frequently observed (Fig. 10). The intima was also the site of a more chronic sclerosing process with increased thickness caused by proliferation of fibrous connective tissue. Superimposed atheromatous changes were often seen, and in half of the cases there were associated granular calcium deposits.

Similar inflammatory and necrotizing changes were observed in the inner layers of the tunica media. The bandlike inflammatory infiltrates in the outer coats of the media consisted mainly of lymphocytes and histiocytes with relatively few neutrophils. Many areas showed intense destruction of the musculo-elastic lamellas of the media, with replacement by fibrous scar tissue in some portions (Fig. 11). Vascularization of the media accompanied these changes. In some foci, flame-shaped zones of perivascular inflammation were reminiscent of syphilitic mesaortitis, but plasma cells were not conspicuous in the exudates. No giant cells were noted in any lesion. At the edges of "skip areas" the inflammatory changes stopped short, and there was abrupt transition to relatively normal aortic wall.

The microscopic alterations in the aortic valve included fibrosis, hyalinization, vascularization, focal fibrinoid necrosis and interstitial accumulation of variable amounts of mucinous ground substance. Calcification of the aortic ring and valve cusps was seen in one instance (case 2).

In another case (case 1) there was a nonvegetative valvulitis with infiltration by neutrophils and mononuclear cells, interstitial edema, and fibrosis and fibrinoid necrosis as well. Subacute bacterial endocarditis involving the mitral valve was also present in one case (case 3). An associated pulmonary arteritis, with similar but milder inflammatory changes to those seen in the aortas, was found in 7 cases (Figs. 12 and 13).

Discussion

The term "panaortitis" is used in these 10 cases to indicate active inflammation of the 3 tunics of the aortic wall in each instance. In addition, the term would connote the lengthwise involvement of both thoracic and abdominal segments, a feature noted in half of the cases.

Panaortitis vs. Luetic Aortitis

Although a number of the gross and microscopic features simulated those of syphilitic aortitis, certain distinctive characteristics were apparent. Involvement of the infradiaphragmatic portion of the aorta is infrequent in syphilis. In only 7 (12 per cent) of 85 examples of luetic aortitis was the abdominal segment affected, and in 6 of these the lowermost extent of the lesions remained well above the level of the renal arteries. We have not found reports of uninvolved "skip areas," circumscribed by arteritic changes, in luetic aortitis. The aortic intimal lesions in syphilis are primarily sclerotic, although mild inflammatory changes may occasionally accompany mural thrombosis. The so-called microabscesses, found in the intima and media of our cases of panaortitis, recalled the appearance of microgummas observed in certain cases of active syphilitic mesaortitis. However, neutrophils accounted for the majority of cells in the former lesions and plasma cells predominated in the latter. Foci of fibrinoid necrosis, frequent in the cases of panaortitis, were rarely observed in the group of luetic aortas.

The occurrence of pulmonary arteritis in rheumatic fever has been referred to previously.[12] Aneurysms of the pulmonary arteries, probably rheumatic in etiology, have been found in association with acute and chronic rheumatic heart disease.[45] Syphilis of the pulmonary arteries is a rare disorder.[46,47] Syphilitic pulmonary arteritis may occur alone, in conjunction with aortitis, or occasionally may be due to extension of a gummatous process in the mediastinum or pulmonary parenchyma. As a rule, only the main trunk is attacked, and there is occasional extension into one of the main branches. The lesions may take the form of a cicatricial mesarteritis identical to that seen in the late stages of syphilitic aortitis, or isolated gummas may arise in any layer of the vessel wall, but acute intimitis is not a characteristic of syphilitic pulmonary arteritis.

Pulmonary arterial aneurysms have also been reported in syphilis.[45,48,49] In 15 of our 85 cases of luetic aortitis, sections of the pulmonary trunk or main extrapulmonary arteries were available for examination, and these showed no inflammatory changes. A careful search of the lung sections in all of our cases of luetic aortitis failed to reveal any examples of intrapulmonary arteritis unrelated to necrotizing bronchopneumonia or thrombo-embolism.

Aortic aneurysms, frequently seen in syphilis, have only occasionally been found in association with rheumatoid panaortitis. One of the 7 cases of rheumatoid aortitis reported by Clark, Kulka and Bauer [16] had a small saccular aneurysm at the origin of the left coronary artery. Single cases of rheumatoid aortitis with aortic insufficiency and aneurysm formation have been reported by Valaitis, Pilz and Montgomery [19] and Hope-Ross, Bien, Palladino and Graham.[27] The former case exhibited several small saccular outpouchings of the supravalvular portion of the ascending aorta; in the latter instance a large fusiform aneurysm extended for 13 cm. distal to the aortic valve.

Although active acute inflammation was apparent in all of our cases of panaortitis, it was invariably associated with chronic or healed lesions. This was evidenced by the bandlike mononuclear infiltrates, by the extensive fibrous thickening of intima and adventitia and by the patchy replacement of musculo-elastic medial tissue by vascularized fibrous scars. A long-continuing inflammatory process without complete healing is thus suggested. Previous authors have not emphasized the presence of acute necrotizing intimitis in cases of rheumatoid aortitis. Conceivably the lesions of rheumatic panaortitis may heal completely in some instances, leaving behind few specific identifying characteristics. Thickening of the aortic wall in chronic rheumatic heart disease [7] may represent the nonspecific, healed, fibrotic stage of a mild rheumatic aortitis. The cases described by McGuire and co-workers [29] may be the healed or end stages of more severe degrees of rheumatic panaortitis, although other rheumatic or rheumatoid stigmas were lacking and the process was confined to the thoracic segments. In contradistinction to our experience, very few of the previously reported cases of rheumatoid aortitis had involvement of the abdominal portions of the aortas. In none of our cases had healing progressed to the point where disappearance of the specific inflammatory changes prevented differentiation from other forms of aortitis.

Pulseless (Takayasu's) Disease

Takayasu's disease is a segmental panaortitis or panarteritis characterized by marked cicatrization of all layers of the involved arteries, and

dense bands of inflammatory cells in the media. Eventually, the involved vessels assume the appearance of tremendously thick-walled, rigid tubes with ultimate obliteration of the lumens due to superimposed thrombosis. The case of Barker and Edwards[37] resulted in occlusive narrowing of both coronary ostiums. The fibrous mural thickening exceeds that seen in all other forms of aortic disease, and, probably for this reason, Takayasu's disease has not been associated with aneurysm formation.

Several reports of idiopathic or unusual primary aortitis associated with renal artery occlusion and hypertension in children are of great interest. These have occurred in young Africans,[50] Chinese children,[51] and in an American Negro girl.[52] Both sexes were affected, and in each child there was a segmental panarteritis of the abdominal aorta with superimposed mural thrombosis. Half of the cases also had segmental involvement of the arch or thoracic portion of the aorta, and in one case the brachiocephalic vessels were involved. It is probable that these were variants of pulseless disease although the case of Lomas, Bolande and Gibson[52] also manifested arthritis of the knee. In a recent report of 6 cases of pulseless disease,[53] 3 had angiographic evidence of involvement of the abdominal aorta in addition to the thoracic portion. In one of these, the pulses were obliterated in both lower extremities as well as in one arm. It would appear that this entity, pulseless disease, originally considered restricted to the aortic arch in young females, has broader implications.

Although the cases of Takayasu's disease and its variants have been termed panaortitis, the changes in the intima are essentially those of edema, fibrosis and collagenization. These appear, in part, to be secondary manifestations of medial and adventitial alteration. In those cases which do have actual inflammatory cell infiltration in the subendothelial tissues, this feature can be related to overlying mural thrombi. None of our cases of panaortitis presented manifestations of occlusion of the branches of the aortic arch or renal arteries. The aortic intimal inflammation in all of our cases was unassociated with mural thrombosis.

The etiology of Takayasu's disease is unknown. Ask-Upmark and Fajers[33,34] felt that it had its place among the rheumatic disorders. In a more recent clinical report, Sandring and Welin[43] postulated a rheumatic or rheumatoid basis.

Giant Cell Aortitis

Since giant cells have been reported in certain cases,[32] a relationship of giant-cell or granulomatous aortitis to pulseless disease has been postulated.[34] However, giant cells may be found wherever there is excessive destruction of elastic tissue,[50] or where there is fresh thrombus formation; they are occasionally seen in syphilitic aortitis but have

rarely been noted in the rheumatic-rheumatoid group of aortitis. Furthermore, in contrast to Takayasu's disease, giant-cell aortitis has not infrequently been associated with dilatation of the aorta,[54] aneurysms[55,56] and even rupture and dissection.[56,57] On the other hand, some cases of giant-cell aortitis have exhibited arteritis and superimposed thrombosis of the carotid arteries, a feature common in pulseless disease.[57,58] In neither pulseless disease nor giant-cell aortitis, however, do inflammatory changes in the intima play a prominent part.

The description of the first case of giant-cell aortitis has been generally attributed to Sproul and Hawthorne.[59] They described two cases of chronic diffuse mesaortitis of unusual type. However, Koszewski[39] believed these represented examples of pulseless disease. The matter was further complicated by Bauer and co-workers,[15] who thought that these cases might fall into the rheumatoid category since one of the patients had ankylosing spondylitis. Giant-cell or granulomatous aortitis and temporal arteritis[60] are now considered to be different manifestations of the same widespread arterial disorder.[61,62] A classical example of Takayasu's disease[63] has been included in a review of giant-cell aortitis.[54] Another case[64] of the pulseless syndrome with giant-cell aortitis and aortic insufficiency, which clinically suggested calcific aortic valvular disease on a rheumatic basis and pathologically resembled syphilitic aortitis, points up the confusing problem of etiology in many cases of aortitis.

Panaortitis, Rheumatic Fever and Rheumatoid Arthritis

The association of heart disease with rheumatoid arthritis is well known.[65–70] The pancarditis is similar to that found in chronic rheumatic heart disease and has, indeed, been interpreted as rheumatic in origin.[66,67,71,72] Thus, the increased incidence of rheumatic heart disease in rheumatoid arthritis suggested a possible etiologic or pathogenetic relationship between these two conditions.[19,66,67,70,71] Bernstein[73] and Blumberg and Ragan[74] supported the view that the cardio-aortic disease in rheumatoid spondylitis was caused by rheumatic fever. However, Clark and co-workers[16] and Schilder, Harvey and Hufnagel[18] disagreed with this thesis. Many necropsy reports have stressed the differences between the cardio-aortitis of rheumatic fever and that of rheumatoid disease.[14–17,75]

Although only half of our cases of panaortitis had other evidences of the rheumatic-rheumatoid disorders, the lesions common to the group as a whole presented a rather specific and dramatic pattern. Not only did these features permit differentiation from other forms of aortitis, but they indicated a distinct similarity between the aortic lesions of acute and chronic rheumatic heart disease and those of rheumatoid spondylitis.

It is our experience and contention that, rather than considering these to be distinctly different entities, they should be regarded as a single manifestation of the general category of rheumatic diseases. We believe this is additional evidence in favor of the close etiologic relationship between the rheumatic and rheumatoid diseases, and further strengthens the argument that rheumatoid and ankylosing spondylitis are in fact one and the same condition. This view is given further support by the case of Bowers[22] in which acute rheumatic fever, peripheral rheumatoid arthritis and ankylosing spondylitis all occurred in the same individual. Necropsy revealed chronic aortitis and aortic valvular endocarditis with aortic insufficiency.

That 5 of our cases should have no other stigma of the rheumatic disorders suggests several possibilities. One, admittedly, is that the entity bears no relationship to the rheumatic state and that the presence of rheumatic manifestations in the other 5 cases is chance occurrence. However, it is possible that subclinical rheumatic disease at other sites may have healed without residual anatomic abnormalities. The localization of the inflammatory changes to the aorta and aortic valve may be an uncommon but just as specific manifestation of rheumatic disease as the well-accepted localization in the mitral valve, myocardium or joints. The occurrence of "nonrheumatic" or idiopathic examples might indicate that this form of aortitis represents the need for a broader concept of rheumatic disease than we presently recognize. It is our opinion that these cases of unusual panaortitis are best grouped together and considered to be manifestations of rheumatic disorder in its broadest context. Whether Takayasu's disease may or may not fall into this category of mesenchymal disorders we are unable to say. However, on gross and histologic grounds it, as well as luetic aortitis, can be differentiated from the cases we have chosen to call panaortitis. The overlapping spectrum of clinical and pathologic features in these various forms of aortic inflammatory diseases require further study before the etiology or definitive classification of the intriguing lesions can be established.

Summary

Ten cases of panaortitis have been presented and an attempt made to differentiate these from syphilitic aortitis and Takayasu's (pulseless) disease.

The term panaortitis was used because of the involvement of all 3 layers of the aorta.

The following morphologic triad served to differentiate panaortitis from luetic aortitis: (a) aortic and pulmonary intimitis; (b) microabscesses and focal fibrinoid necrosis of the intima and media; (c) in-

volvement of the abdominal aorta with sharply delineated "skip areas."

A comparable group of 85 instances of syphilitic aortitis was examined to test these criteria.

Pulseless disease, and its variants, differed from our cases in that the brachiocephalic or abdominal branches of the aorta were involved, usually with superimposed thrombosis. None of our cases exhibited occlusive lesions of these vessels, and the histologic lesion of panaortitis did not correspond to that seen in Takayasu's disease.

Five of the 10 cases were characterized by rheumatic or rheumatoid manifestations; hence the morphologic features of the aortitis were causally attributed to the rheumatic diseases. The remaining cases showed sufficient gross and histologic similarities to suggest that, possibly, the panaortitis was also rheumatic, in the broader sense.

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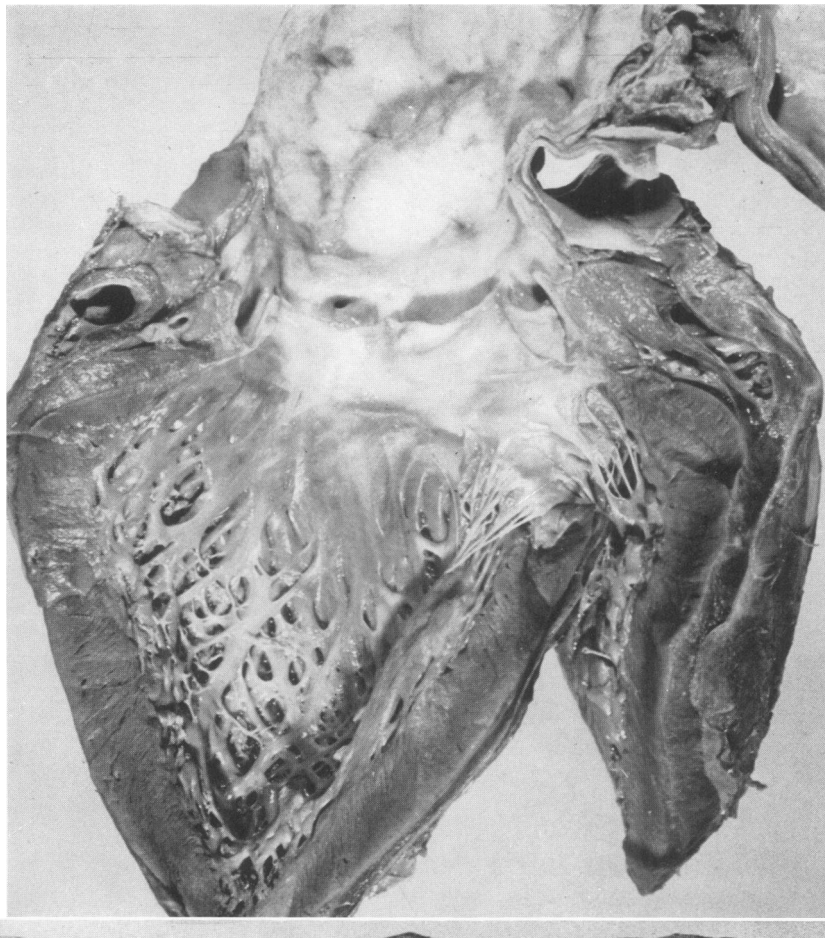
[*Illustrations follow*]

Legends for Figures

FIG. 1. Case 4. The aortic cusps are rolled and shortened; the commissures are widened. The hypertrophied and dilated left ventricle exhibits subendocardial fibrosis. The ascending aorta is thickened and has a wrinkled intimal surface.

FIG. 2. Case 4. There is marked mural thickening and intimal irregularity of the descending thoracic and upper abdominal portions of the aorta. Note the abrupt transition to smooth, relatively normal intima just above the level of the renal artery orifices (arrows).



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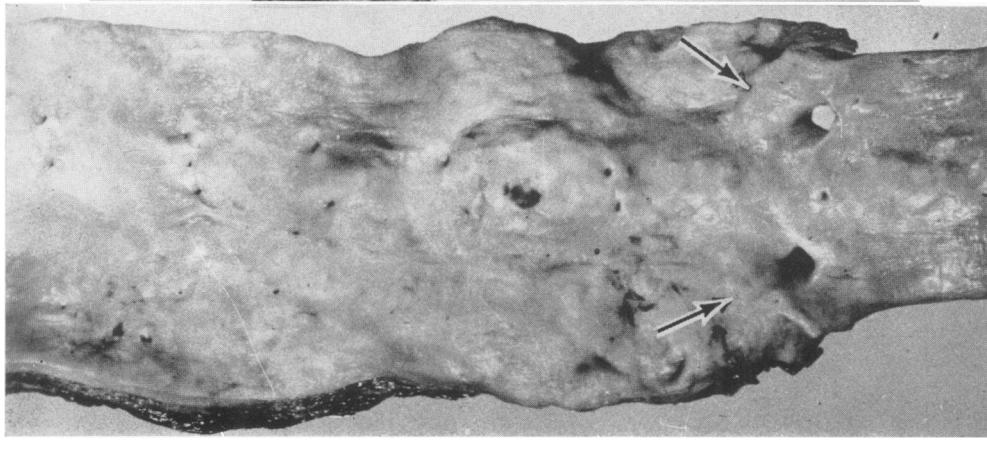

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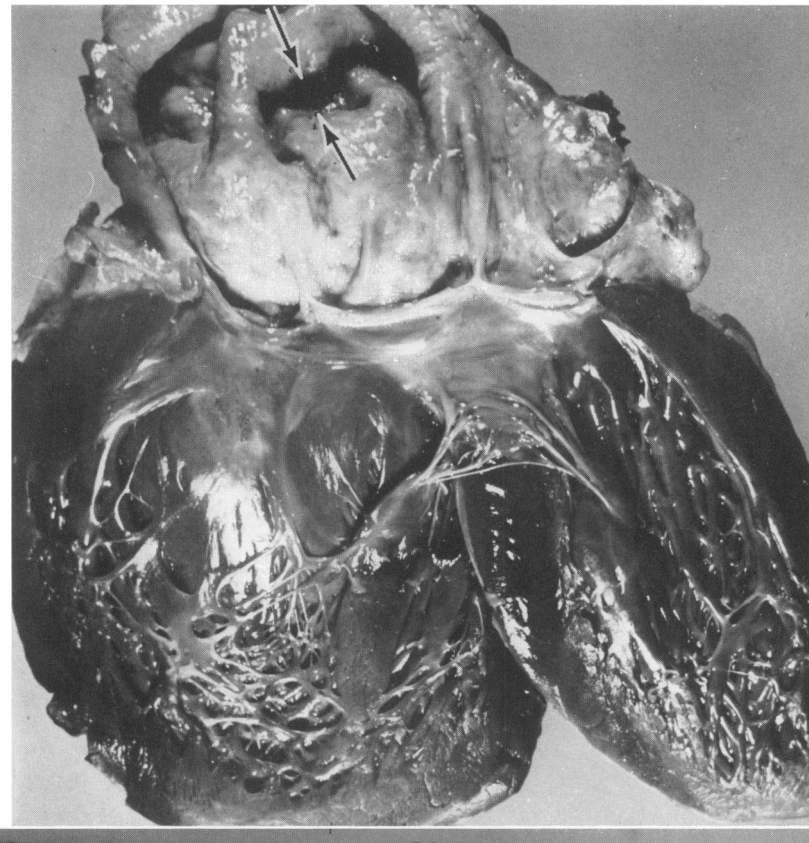

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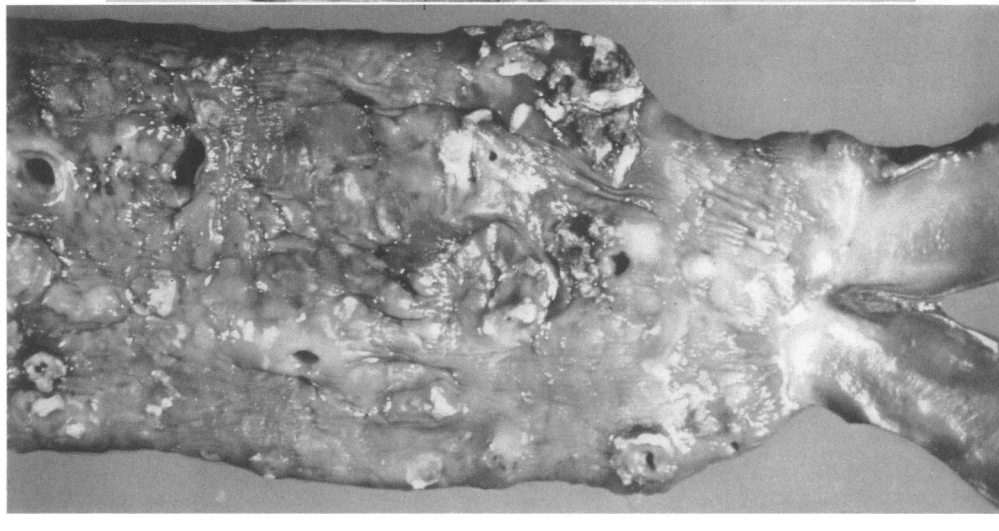

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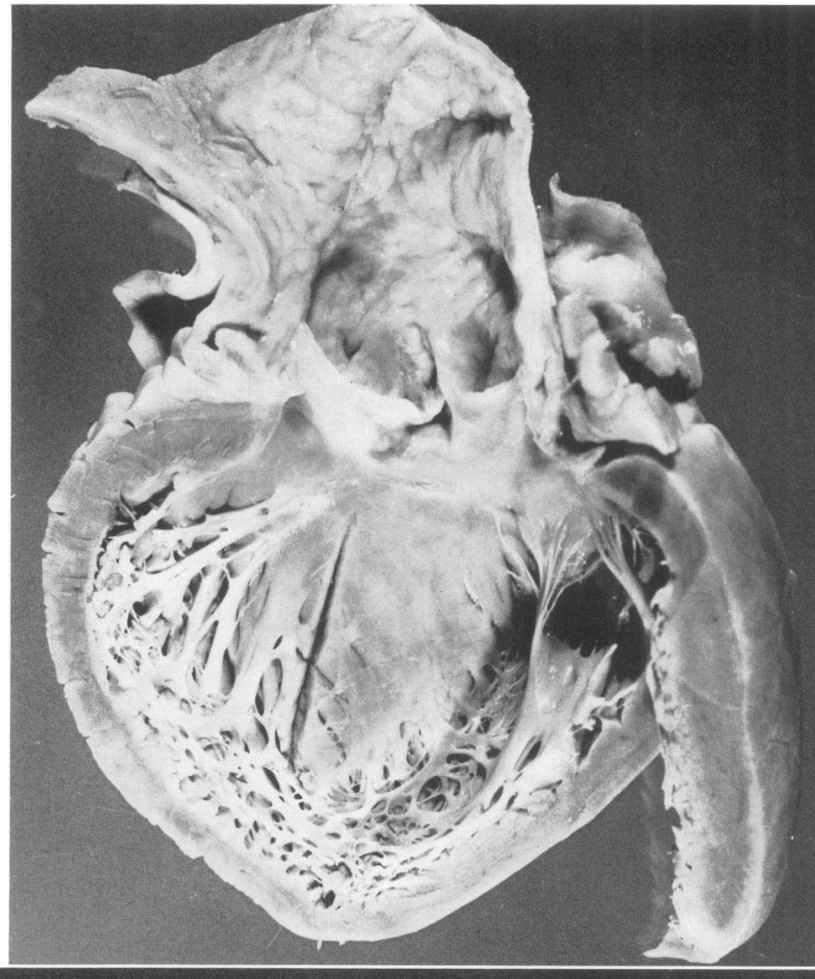
FIG. 3. Case 6. A globular left ventricle and dilated aortic ring are apparent. The valve cusps are rolled and shortened. A small saccular aneurysm (arrows) protrudes from the posterior aspect of the widened ascending aorta.

FIG. 4. Case 6. Prominent wrinkling of the lower abdominal aorta with interspersed sclerotic and atheromatous plaques are manifest. A sharp line of demarcation appears just above the bifurcation, and the common iliac arteries have a normal appearance.



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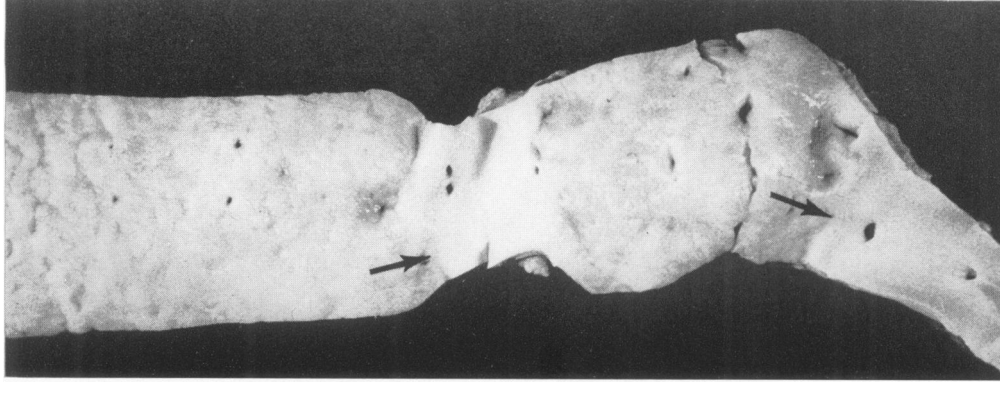

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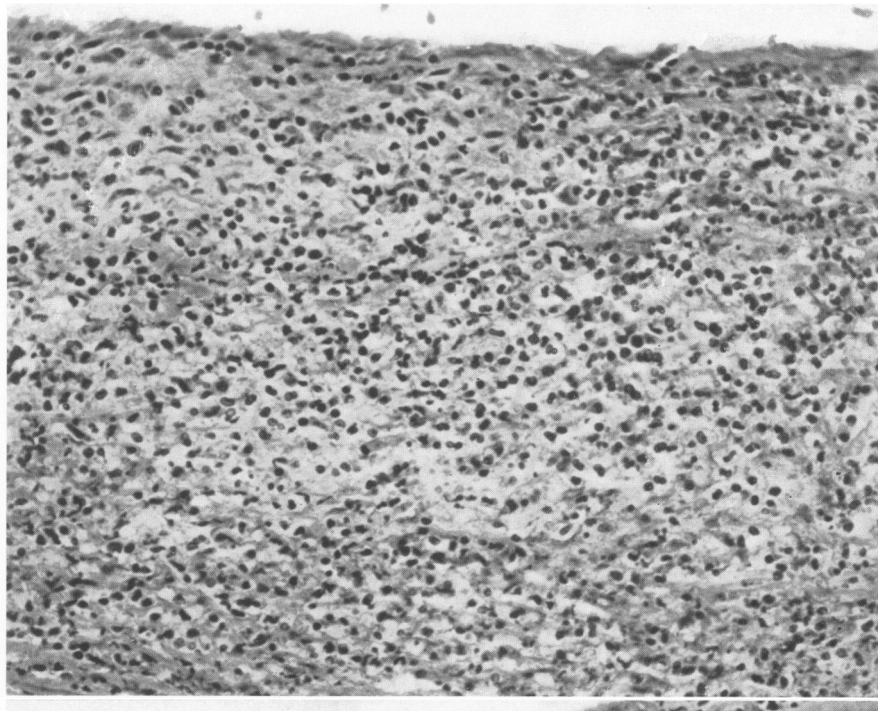
FIG. 5. Case 7. The cusps and commissures of the aortic valve are grossly distorted, and the left ventricle exhibits eccentric hypertrophy. The intima of the thick-walled ascending aorta is puckered.

FIG. 6. Case 7. Intimal puckering and mural thickening of the descending thoracic and abdominal portions of the aorta are evident. Segmental involvement is characterized by sharply demarcated "skip areas" (arrows).



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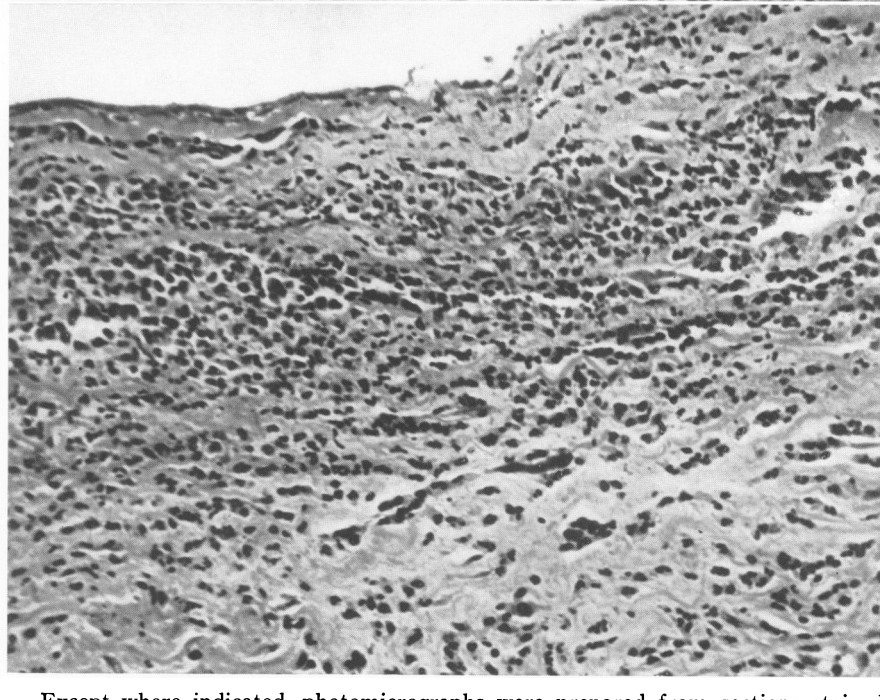

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Except where indicated, photomicrographs were prepared from sections stained with hematoxylin and eosin.

FIG. 7. Case 1. Aorta. There is diffuse necrotizing intimal inflammation, the exudate consisting chiefly of neutrophils. × 250.

FIG. 8. Case 4. Aorta. Severe intimitis is characterized by linear and diffuse infiltrates of neutrophils and mononuclear inflammatory cells. × 250.

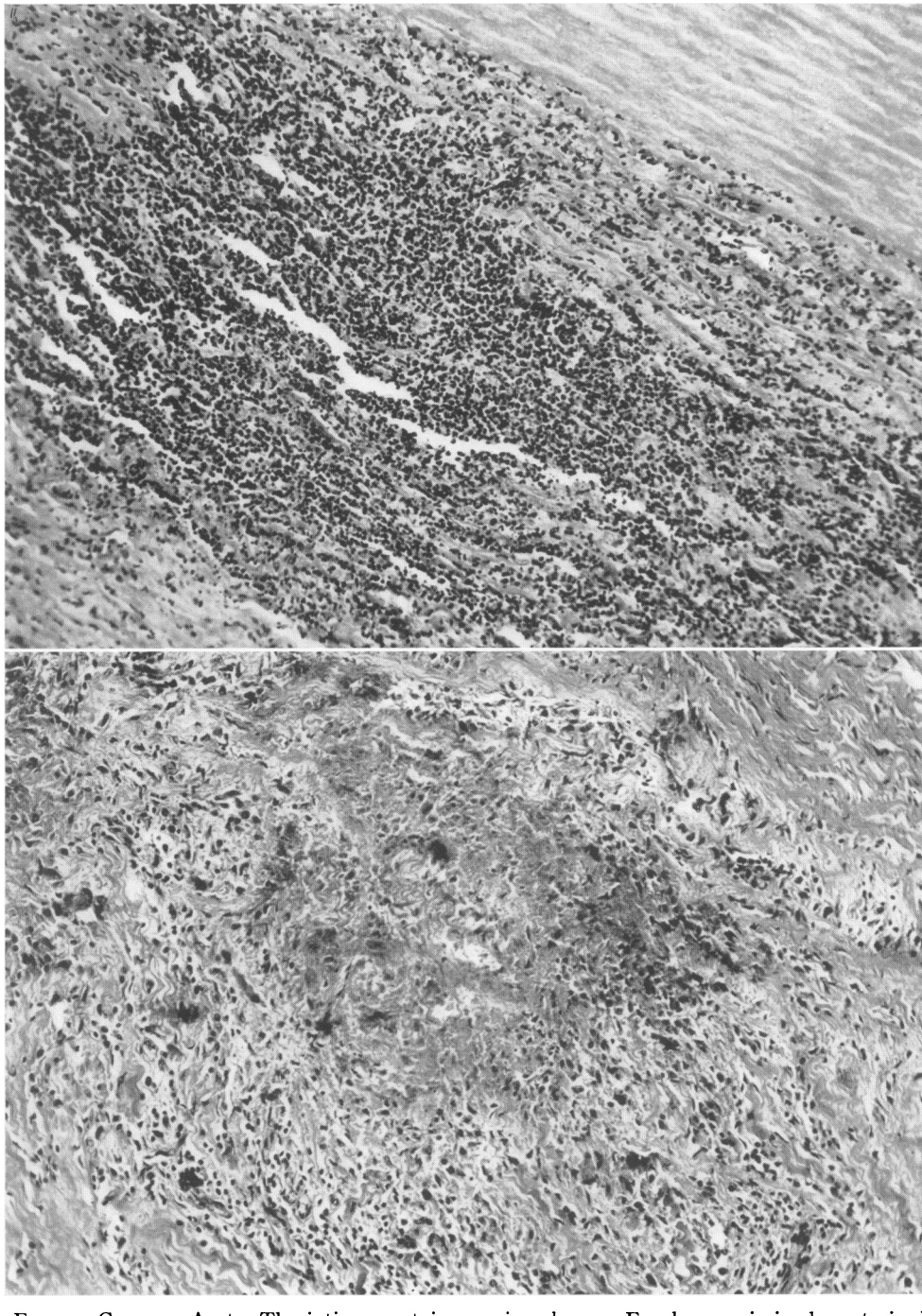

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FIG. 9. Case 4. Aorta. The intima contains a microabscess. Focal necrosis is characterized by neutrophils and nuclear fragments. × 170.

FIG. 10. Case 7. Aorta. Focal fibrinoid necrosis appears at the junction of the intima and media. Histiocytes and mononuclear leukocytes surround the necrotic central zone. × 170.

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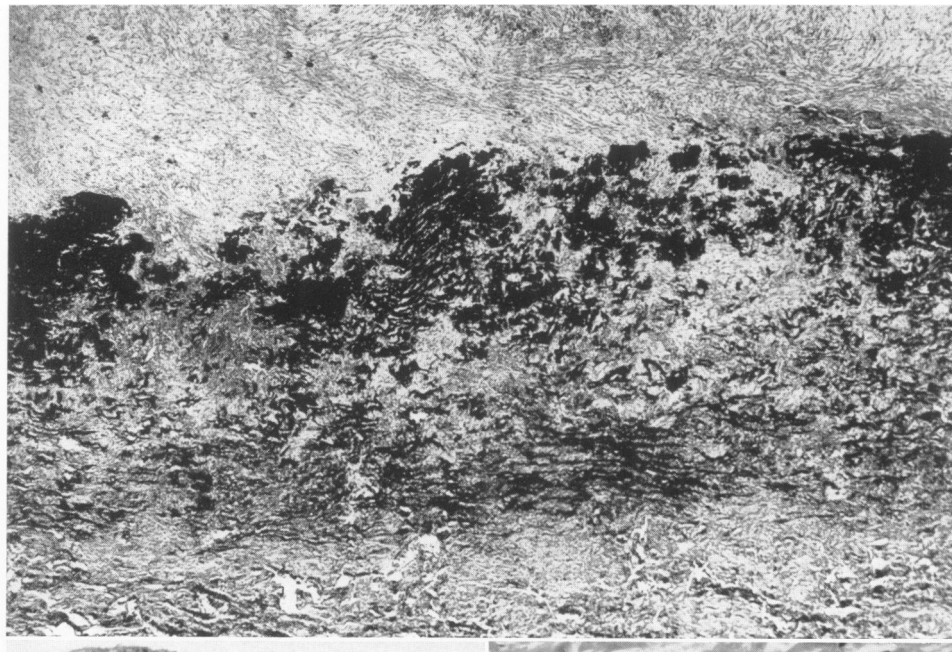

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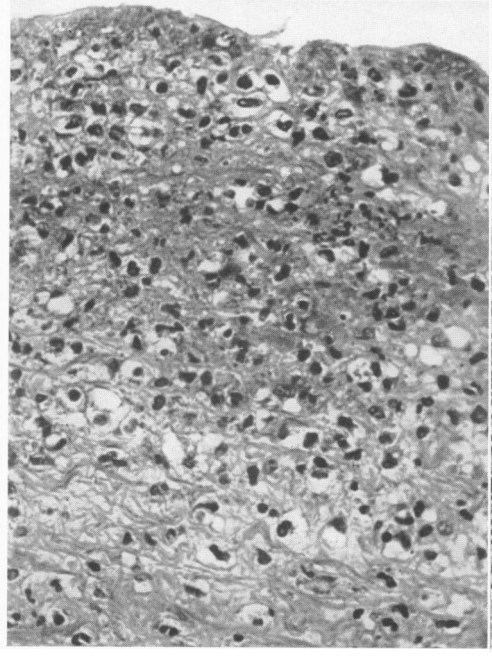

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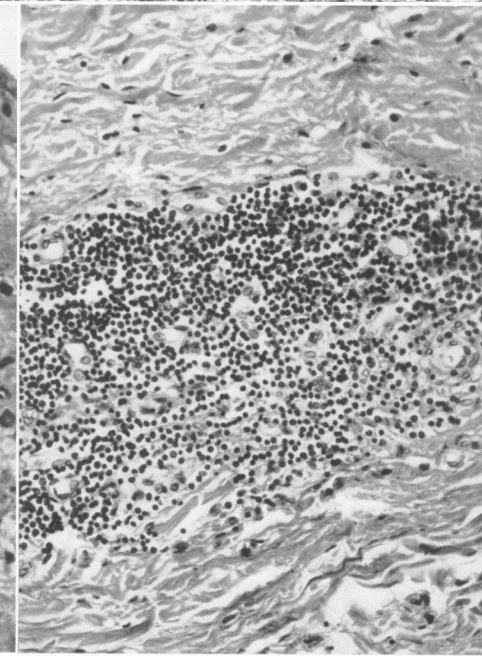

FIG. 11. Case 7. Aorta. An elastic tissue stain shows the extensive, patchy destruction of the medial elastic lamellas. The intima and adventitia exhibit fibrous thickening. Verhoeff-van Gieson Stain. × 30.

FIG. 12. Case 1. Pulmonary artery. There are diffuse inflammation and focal necrosis in the intima. × 340.

FIG. 13. Case 6. Pulmonary artery. A bandlike lymphocytic infiltrate appears in the fibrotic adventitia. × 170.