37° C. for both A₁ and A₂ cells. Further, there was a prozone phenomenon in the test for A₁ agglutination at 4° C. It was shown by a blocking test (Race, 1944; Wiener, 1944) that this prozone was due to the presence of an anti-A blocking antibody.

Time of Test	Cells	Temp.	Serum Dilutions											T
			1/1	1/2 ¹	1/2 ²	1/2 ³	1/2 ⁴	1/2 ⁵	1/2 ⁶	1/2 ⁷	1/2 ⁸	1/2 ⁹		
Day of transfusion	A ₁	37° C.	½	++	+	w	—	—	—	—	—	—	—	
	A ₂	4° C.	3½	3½	3½	2½	2	—	++	++	—	—	—	
		37° C.	++	+	w	2	1	++	++	—	—	—	—	
4th day	A ₁	37° C.	2	2	1	+	w	—	—	—	—	—	—	
	A ₂	4° C.	4	4	4	3	3	—	—	—	—	—	—	
		37° C.	++	++	(+)	?	?	++	+	—	—	—	—	
8th day	A ₁	37° C.	4	4	4	4	4	3	2	1	½	++	—	
	A ₂	4° C.	4	4	4	4	4	3	2	2	++	(+)	—	
		37° C.	4	4	4	3½	3	2½	1	++	++	++	—	
30th day	A ₁	37° C.	2½	4	3	3½	3½	3½	3	2½	2	2	—	
	A ₂	4° C.	++	(+)	+	+	3½	3½	3	3	2	1	+	—
		37° C.	2	2	+	+	3	3	3	2	2	1	1½	—

Scores for agglutination are given in arabic signs (for visual agglutination) and the signs usually employed for microscopical agglutination in Rh work (M.R.C. Memorandum, 1943).

Unfortunately the patient could not be followed up, and we are not aware of his actual agglutination pattern for A₁ and A₂ cells. Nevertheless, his immune response to an incompatible transfusion confirms our observation of ABO iso-immunization in pregnant women and of experimental hetero-immunization in rabbits.

Upon immunization with an antigen corresponding to a natural agglutinin present in the animal's serum (anti-A or anti-B in man, anti-sheep in rabbits), the first noticeable change would be a slight rise in titre, followed quickly by an inversion of the thermal optimum in quantitative agglutination tests. A further step would be the apparition of a prozone corresponding to the production of "blocking antibodies."

The *in-vitro* differences in the behaviour of "natural" cold anti-A and anti-B agglutinins and the "immune" warm anti-A and anti-B antibodies are probably dependent on their chemical structure, which would account for their harmfulness to the foetus. It is a significant fact that we found these warm agglutinins in the only instances quoted above with their particular clinical course, and that they were not found in uneventful heterospecific blood-group pregnancies.

Summary

A case of immune response to an incompatible blood-group transfusion is described. There is a definite difference *in vitro* between natural and immune anti-A agglutinins.

The same difference is found in maternal iso-immunization, the particular form of haemolytic disease following A and B sensitization being the death of the foetus *in utero*, either during the last days of pregnancy or at the time of delivery.

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DIAGNOSIS AND TREATMENT OF CUTANEOUS ANTHRAX

BY

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Anthrax—a rare disease in this country—has many interesting and unusual facets. Probably first recorded by Virgil, it became prominent initially in Britain about the middle of the last century coincidentally with the importation of alpaca and mohair to Bradford. It was first notifiable so far as factories and workshops were concerned in 1896, and activity was rapidly directed towards its prevention in view of the high proportion of fatalities among affected workers—then some 20 to 30%. Local precautions in the form of protective clothing, the posting of information regarding the disease, washing facilities, and exhaust ventilation for certain processes were advocated by the Anthrax Investigation Board set up in Bradford by the Chamber of Commerce. Despite these the incidence remained high, though the dread and fatal form of pulmonary infection showed a rapid decline between 1881, when Mr. John Spear made his investigations, and 1905, when Dr. T. M. Legge gave the classical Milroy Lectures on industrial anthrax.

A further Anthrax Investigation Committee set up in 1913 advocated, in 1918, a process for wool and hair disinfection. Following up the committee's suggestions, Parliament passed the Anthrax Prevention Act in 1919, and by 1921 an experimental disinfecting station had been set up in Love Lane, Liverpool, to carry out the "Duckering process"—named after the secretary of the above committee—for wool and hair disinfection, and in succeeding years this process has proved its efficacy. Mention should be made of the excellent bacteriological investigations carried out for both the board and the committee by the late Dr. F. W. Eurich, professor of forensic medicine at the University of Leeds.

From 1890 to 1920 an increase in the incidence of anthrax was also noticed in the cattle of Great Britain, though the numbers were never comparable to those encountered in Russia, Siberia, China, and parts of India. Knowledge about the means of spread of the disease and the life history of the organism enabled measures to be taken which may be briefly summarized under the headings of—notification, isolation, and destruction of the sick animal or carcass, disinfection of the surroundings, and inoculation of other animals. These not only rapidly controlled the disease among cattle but also diminished the incidence among butchers, veterinarians, shepherds, and others associating with animals, the true index of which was never known, since only cases occurring in certain trades were then notifiable. This anomaly of notification was widely commented upon in coroners' courts, medical journals, and Parliament at the time.

In the four or five years following 1915 the incidence of anthrax increased both here and in America, the source being shaving-brushes made from infected hair. This source was soon recognized as being especially dangerous, since it was not confined to any particular trade or industry, claiming among its victims a professor of law and a

Congregational minister, to name but two, and precautions were rapidly taken—in particular an Order made under the Act of 1919 banning the importation into Britain of shaving-brushes of Japanese origin. Sporadic cases from this source have been reported up to 1939—some from brushes bought years previously, in which the spores had lain dormant until the unlucky coincidence of shaving-cut and spore ignited the powder of disease.

The disease contracted from wool and hair and that in animals are thus largely controllable, but there still remains a further common source of infection—namely, imported hides and skins. This source gives rise to cases not only in tanneries but also in dock workers, carters, and warehousemen, as well as very occasionally in persons coming in contact with leather. Methods aimed at killing the hardy spore in the hides tend to damage the material, and though suitable disinfecting processes have been claimed by Seymour-Jones, of Wrexham (and advocated by Ponder), and by others in Germany, they have not been adopted. Cases from this source arise from time to time, and the following is a report of eight such cases occurring in two tanneries in Leeds and district in a period of fourteen months.

Occupation and Source of Infection

All eight cases were of the cutaneous type of infection, and all occurred in men doing essentially the same tasks at two different tanneries (named for convenience "A" and "B") in widely separated areas. Tannery "A" deals

At both tanneries the full regulations as laid down in various Acts are carried out, the men wearing protective clothing, and washing facilities and changing-rooms being provided. In the opinion of the authorities at these tanneries it is the increased demand for raw materials which has given rise to the present outbreak, the materials being collected from various remote regions in Africa where there is little or no control over the source of the hide or skin. No cases have ever occurred at either tannery in the processes carried out beyond the lime-vats.

Occurrence of Infection. Contact Cases

The necessity for a local skin abrasion together with the presence of the organism before the appearance of a malignant pustule has long been known, and is borne out by these cases, in all of which there was good cause for a local abrasion such as collar-chafing or shaving-cuts. Even in Case 4, in which the lesion was on the leg, there were also numerous flea-bites. It is interesting to speculate in this connexion whether a break in the lung "lining surface" is not also necessary before the development of pulmonary anthrax. Spore-laden dust was plentiful at tannery "A" and yet no pulmonary cases have occurred to date. Also the rapid decline in incidence of pulmonary anthrax from 1880 onwards parallels the improvement in general public health and the decline of tuberculosis in particular.

All cases presented the classical malignant pustule, and in all the diagnosis had been made by the patient or a fellow

TABLE I.—*Summary of Cases*

Case	Age	Tannery	Source of Hides	Site of Lesion	Duration	Stay in Hospital	Date of Admission	Constitutional Symptoms on Admission	Smear	Culture	Animal Inoculation	Contacts
1	50	A	Indian and E. African goat-skins	Below and behind right ear	26 hrs.	24 days	27/11/47	Nil	Pos.	Pos.	Pos.	4
2	48	A	E. African goat-skins	Left temple	4 days	17 "	22/12/47	"	"	"	"	1
3	42	A	" " " "	Right side of neck	3 "	16 "	16/2/48	"	"	"	"	7
4	49	A	E. and W. African goat-skins	Posterior right calf	20 hrs.	13 "	21/2/48	Severe	"	"	"	7
5	29	A	" " " "	Right cheek	4 days	13 "	22/2/48	Nil	?Pos.	Neg.	Neg.	2
6	53	A	" " " "	Posterior right neck	6 "	33 "	20/8/48	"	Pos.	Pos.	Pos.	1
7	30	B	E. and W. African cowhides with some S. American and Indian	Left cheek	3 "	17 "	29/5/48	"	"	"	"	2
8	29	B	S. African and Nigerian cowhides	Below and behind right ear	3 "	19 "	24/12/48	"	"	"	"	4

mainly with goat-skins coming from various sources as indicated in Table I, but principally from East and West Africa. All six men from this tannery were employed opening the bales of skins, carrying the skins up to a sorting-shed, sorting them, and then sending them down a chute to the lime-yard when required. As one man after another fell victim other men took their place, and eventually they too became patients. Of the seven different men undertaking these tasks during the past fourteen months six have contracted anthrax. The previously reported cases occurring at this tannery were two in 1936 and two in 1946. Certain alterations have now been carried out in the hope of reducing the risk.

Tannery "B" deals with cowhides chiefly from East and West Africa, though occasionally from South America and India. All are dry hides, as opposed to the wet salted variety which rarely give rise to infection. The duties of the men at this tannery are precisely the same as those at "A"—but owing to the demand for goods and the shortage of raw material there is very little storage of hides at present, and they are almost immediately taken to the water- and lime-vats on unbaling, and there is no chute system. During the eight-months period in which cases occurred there were some 12 to 15 men working in this part of the tannery. There had been no previous cases.

workman—from their knowledge of the disease obtained by experience or from a poster hung in the factory—and never by a physician. In some cases delay in admission was actually caused by the physician.

Man-to-man infection is surprisingly rare. There are recorded cases in the literature—Hodgson (1937) records two—but their number is small, and this is surprising in view of two points which can be seen in Tables I and III—namely, the length of time during which the patient may be in contact with his family, often in a small house, and the fact that his normal healthy skin may give a positive growth of organisms, showing the widespread nature of their distribution. The intact skin must in many cases be a barrier of unusual strength in preventing the appearance of contact infection.

Diagnosis

This is made on the following three salient points.

1. *Appearance of Lesion.*—In all eight cases this was typical—a black, necrotic centre, a ring, partial or complete, of pearly translucent vesicles, the whole sitting on a red base on a hillock of widespread oedema. Certain other features aid the physician. The absence of pain with such a degree of oedema is noticeable. Practically the only local symptom encountered in this series was slight itching.

Earlier stages than this in the development of the lesions are described, the commonest being the large vesicle under which the black eschar forms, but these were not seen by us even in the patient who presented within 26 hours of the onset of disease. Constitutional symptoms and signs were not common. Only Case 4 presented with pyrexia, though Cases 3, 6, and 8 had pyrexia on the second or third day of treatment, with associated headache, malaise, and often pains in the bones. In Case 6 this may have been of other causation (see below).

2. Occupation of Patient.—At present this is a reasonably straightforward clue, anthrax occurring in those industries where exposure to infection is well known. A survey of the literature has shown that the disease may appear under most unlikely circumstances. For example, it may occur in carpet-layers, paper-hangers (from wall plaster), menders of sacks (which have carried bones, horns, or hooves), and carriers of potatoes (from soil), and from mink farms, elephant tusks, elephants at the London Zoo, etc. A physician may be forgiven for not suspecting the condition in patients in occupations such as these, but in persons connected with animals or animal products (especially imported ones) presenting with a localized skin lesion, or occasionally multiple lesions, anthrax should be a first consideration.

3. Bacteriological Diagnosis and Investigations.—These are the final proof, and were obtained in all our cases except Case 5, in which the first two criteria were adequately fulfilled—justifying treatment for anthrax. The following investigations were carried out in this series.

Bacteriological Examination

As soon as a case was suspected of being due to *Bacillus anthracis*, material from the local lesion was taken for investigation. The most practicable way of taking this material was found to be with a Pasteur pipette, plunging the point into the centre of a vesicle, or vesicles if confluent, and withdrawing the fluid. If there were no obvious vesicles, or they had burst, then material was aspirated from beneath the edge of the eschar. The fluid obtained was clear, yellow, or sanious in nature, there being no evidence of pus macroscopically.

As a routine this material was cultured aerobically on heated and fresh blood agar, and two thick films were made, stained with Gram and Leishman respectively. On examination of the Gram film a long time was often spent before coming across one, two, or perhaps a small chain of bacilli—this being especially true in five of the seven positive cases. In the other two the vesicular fluid was heavily infected with the organism. In no case was there any marked polymorphonuclear leucocytic response. In the seven positive cases the appearance of the bacillus was morphologically typical of *B. anthracis*—a large, straight, capsulated, Gram-positive bacillus with parallel sides, clean-cut square ends, with a tendency to chain formation. As confirmed by others, there was no evidence of spore formation in the human tissue fluids.

The growth after 18 to 24 hours on the solid media invariably showed an almost pure culture of *B. anthracis*, with occasional colonies of *Staphylococcus albus* and diphtheroids. There was no evidence in any case of invasion by other pyogenic organisms. The colonies at 24 hours' growth had the typical reticulated surface with irregular wavy edges (so-called barrister's wig), producing proteolysis on the heated blood-agar medium and no haemolysis on the medium containing the fresh blood.

These colonies were subcultured, and after the organism had been isolated in pure culture the following investigations were carried out.

Morphology.—Routine films from the 24-hour culture showed the typical rod-shaped appearance of the organism in heavy interlacing chains, capsulated, and associated with the production of numerous spores. These were mainly central or subterminal, but there were many spores also lying free. The characteristic morphology was retained on repeated subculture.

Motility.—This was determined by growing the organism in a semi-solid nutrient-agar medium in a 1-in. (2.5-cm.) diameter boiling-tube. A small-bore glass tube was inserted into the boiling-tube, the *B. anthracis* being inoculated on to the surface of the agar in the small tube. The organism, being non-motile, remained localized on or just below the surface of this agar. If the organism had been an anthracoid, then owing to its motility growth would have proceeded down the small tube and eventually infiltrated the larger volume of agar outside. In all the seven strains investigated the organism was non-motile.

Proteolytic Activity.—Gelatin prepared in large boiling-tubes was inoculated as a stab culture at 24° C. The lytic effect in gelatin is a slow but definite effect. In two cases only did the organism produce the truly characteristic inverted fir-tree phenomenon. The other five strains seemed to produce little attempt at canalicular liquefaction, there being just a central core of proteolysis.

Effect of Antibiotics.—All the strains were tested for their sensitivity to penicillin and streptomycin. The usual punch-hole plate method was adopted. Table II shows the degree

TABLE II.—Sensitivity to Antibiotics: Animal Pathogenicity

Case No.	Strain	Sensitivity Compared with Oxford <i>Staph. aureus</i>		Death of Mouse after Inoculation
		Penicillin	Streptomycin	
1	I	25% less	Equivalent	34 hours
2	II	50% "	10% less	36 "
3	III	10% "	80% "	36 "
4	IV	20% "	10% "	30 "
6	V	25% "	5% "	20 "
7	VI	20% "	10% "	35 "
8	VII	Equal	75% "	30 "

of inhibition compared with that of the Standard Oxford *Staph. aureus*. Thus in all cases the strain was sensitive to both penicillin and streptomycin in fairly low concentrations. It is interesting to observe that on the whole the strains showed greater inhibition with streptomycin than with penicillin, using equivalent concentrations of streptomycin per ml. No production of strains resistant to these drugs was noted, as the organism was never recovered from the lesion after the patient was placed on intensive treatment. The strains on an average were sensitive to 10 units of penicillin per ml. and to 5 to 10 units of streptomycin per ml.

Animal Pathogenicity.—In the seven cases in which the organism was isolated the mouse was utilized for virulence tests. A volume of 1 ml. of a 24-hour "oxopectone" broth culture was injected subcutaneously into the right half of the anterior abdominal wall. The animals were isolated in glass containers, the carcass, food, faeces, etc., being autoclaved after necropsy. Death occurred in all cases within 36 hours, as shown in Table II. At necropsy the local lesion was haemorrhagic, hyperaemic, and oedematous, the spleen was congested and enlarged, and on microscopical examination the oedema fluid, splenic pulp, and heart blood were found to contain enormous numbers of Gram-positive bacilli, yielding pure heavy growths of *B. anthracis* on culture.

In addition to the above investigations on individual strains, in each case a series of swabs were taken from the hair or skin of the patients in order to ascertain the presence or otherwise of *B. anthracis*. Table III summarizes the

results of these investigations, carried out before the third day of treatment (usually on the first day). Similar investigations made towards the end of the stay in hospital were negative, as were cultures made from materials taken from beneath the eschar after complete therapy.

TABLE III.—Skin Cultures

Case No.	2 in. Above Lesion	2 in. Below Lesion	Hair of Scalp	Right Palm	Left Palm	Right Groin	Left Groin
1	Neg.	Pos.	Pos.	Neg.	Neg.	Neg.	Neg.
2	"	Pos. A	Neg.	"	"	"	"
3	"	Neg.	"	"	"	"	"
4	"	"	"	"	"	"	"
5	"	"	"	"	"	"	"
6	"	"	"	"	"	"	"
7	"	"	"	Pos.	"	"	"
8	"	"	"	"	"	"	"

Neg. indicates only normal flora grown. Pos. indicates *B. anthracis* cultured. Pos. A indicates anthracoids cultured.

Treatment

In no case was surgery contemplated. Excision and incision, especially the murderous crucial incision which was once performed, play no part in the modern treatment of anthrax, and are probably harmful, breaking down natural barriers. A study of the literature has revealed that excision performed very early was possibly beneficial, but incision was almost invariably followed by death, and thus was much worse than no treatment at all. In this series the local lesion was covered with a dry sterile dressing and left alone after the necessary bacteriological examinations. The part was immobilized as far as possible: if on the head and neck the patient was nursed flat with the head between sandbags; if on a limb, as in Case 4, the limb was splinted. The following specific treatment was

TABLE IV.—Treatment

Case	N.A.B.	Serum	Penicillin* (units)	Result
1	1.5 g. over 10 days	145 ml. in 4 days	650,000	Cure
2	1.05 g. in 6 days	90 ml. in 5 days	2,265,000	"
3	1.2 g. over 5 days	160 ml. in 5 days	1,344,000	"
4	1.2 g. over 8 days	240 ml. in 5 days	3,520,000	"
5	1.2 g. over 5 days	80 ml. in 2 days	2,048,000	"
6	1.2 g. over 6 days	320 ml. in 4 days	5,400,000	"
7	1.8 g. over 13 days	80 ml. in 2 days	2,800,000	"
8	1.2 g. over 6 days	420 ml. in 6 days	6,018,000	"

carried out (Table IV), since the literature concerning patients treated successfully with penicillin alone had not been studied when the first case was admitted.

Neosphenamine.—This drug was given in two or three doses of 0.45 to 0.6 g. intravenously at five- to seven-day intervals. Doses such as these given once or twice at one- to three-day intervals have been used successfully without any other therapy (Becker, 1912a, 1912b; Pijper, 1926).

Anti-Anthrax Serum.—Until recently this has been the mainstay of treatment. Advocated by Sclavo in Italy, by Marchoux in France, and by Legge (1905) in Britain, it soon became widely used—at first in combination with surgical treatment, and later alone, with definite success. Dosage advocated differed—from 40 to 80 ml. by early workers (Legge, 1905; Lockwood and Andrewes, 1905; Bowlby and Andrewes, 1905) to 600 ml. and upwards (Hodgson, 1941; Gold, 1942). In the above series the average dosage was 90 ml. in some seven injections over four days—the total varying with the need and response of the patient. Usually between 60 and 100 ml. was given intravenously on the first day of treatment. No severe reactions were encountered during the time of serum administration, but all cases developed urticaria and pruritus on the eighth day after the start of serum therapy. This was readily controlled by the use of calamine lotion containing 1% phenol locally and "anthisan" internally, 100 mg. three

times a day with meals. The serum used, apart from the first case, was that marked "War Agricultural Committee," contained in rubber-capped 500-ml. bottles. Case 1 had the product manufactured by Mulford's, and later some 90 ml. of Lister's antiserum.

Penicillin.—Several reports are now in the literature of cases of cutaneous anthrax treated successfully with penicillin alone (Murphy *et al.*, 1944; Ellingson *et al.*, 1946; Griffin *et al.*, 1948). The suggested dose increases as the years go by, starting with a total dose of 200,000 to 400,000 units advocated by Murphy *et al.*, to 5,000,000 units advocated by Griffin *et al.* The average dose used in our series was about 3,000,000 units, given usually as 64,000 units three-hourly, though occasionally as 250,000 units twice daily.

Sulphonamides.—Sulphonamides were used not as specific therapy, though claims have been made for their curative powers in anthrax by Gold (1942), but in an attempt to remove the secondary invading organisms in the lesion—usually *Staph. aureus*. The dosage was small, a total of 15 g. over 10 days being the average. In Case 4 secondary infection with a purulent discharge was very troublesome, and the patient attended as an out-patient for local and general (penicillin) therapy for some two months after the cure of the anthrax.

Case 6 presented an interesting therapeutic problem in that he had latent seropositive syphilis in addition to anthrax. On the fourth day of treatment with serum, neosphenamine, and penicillin, he had a pyrexia of some 101° F. (38.3° C.) lasting for eight hours; since this occurred about eight hours after the last injection of serum, the possibility of a Jarisch-Herxheimer reaction was considered. Luckily there was no focal flare-up of the syphilis—at least, it was not in evidence. A study of the literature has not revealed a similar case.

All cases have been visited since discharge from hospital. All possess a small scar which is barely noticeable. All are well, and so far none has contracted any further lesion. Second attacks are uncommon, but do occur (Inda, 1921) and are said to be mild. The two men now doing the dangerous work at tannery "A" are both discharged cases, but it is hoped that the alterations carried out at this tannery have reduced the risk of infection. A third man from tannery "A" has returned to work, but in a job connected with the further processing of the leather and not in the lime-yard. The remaining three have obtained other employment. Both men from tannery "B" have returned to work in their original occupation.

Summary

A brief survey of the sources of anthrax shows control to be applicable and useful in all but hides and skins, and a report is given of eight cases occurring in Leeds and district over a period of 14 months in persons connected with these raw materials.

The salient points concerned in the diagnosis are given, together with the details of the isolation and identification of the organism in seven cases by direct films, culture, biochemical activity, and animal inoculation.

The effect of penicillin and streptomycin on the organism is discussed, and the routine investigation of skin culture before and after treatment is cited.

Methods of treatment past and present are briefly given, and the conclusion is reached that, for all practical purposes, penicillin is probably the most desirable method to-day—from the point of view of effectiveness, time of hospital stay, expense, and unpleasant side-actions.

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ACUTE PERICARDITIS SIMULATING CARDIAC INFARCTION

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Simulation of cardiac infarction by acute pericarditis is well recognized by cardiologists, though references are not numerous (Barnes and Burchell, 1942; Wolff, 1944). Pericarditis in such cases is of unknown aetiology, since an obvious cause would leave no doubt about the diagnosis. It forms a subgroup of the type mentioned by East and Bain (1948), in which "cause and association are quite obscure," and is termed by Peel (1947) "primary or idiopathic," by Dry (1943) "non-specific . . . from which recovery may be complete," and by Andrews *et al.* (1948) "acute idiopathic." The infrequency of specific references seems to justify a report of only two cases. The association of one with a general arterial disease suggests a possible mechanism.

Case 1

A man aged 63 was admitted to the Royal Sussex County Hospital on July 23, 1948, and was diagnosed clinically as a case of temporal arteritis. Biopsy confirmed the diagnosis and relieved a severe headache: the histological report was, "The adventitia is infiltrated with round cells, among which are a few eosinophils and giant cells. There are areas of necrosis in the media. The appearances are typical of temporal arteritis." Though the condition was regarded as still active, with persistent fever, a predominantly polymorph leucocytosis of 11,800, and an erythrocyte sedimentation rate of 31 mm. in the first hour (Wintrobe corrected, normal 0-10), discharge was necessary after a fortnight.

Headaches returned, however, and he was awaiting readmission, when in the early hours of Sept. 21 he was suddenly attacked by a pain under the left costal margin which spread to the lower substernal area. He was admitted 16 hours later, with evident severe substernal pain but negative clinical findings except for fever of 100° F. (37.8° C.) and what was regarded as triple heart rhythm. During the next 24 hours his temperature fell to normal and the pain disappeared, but a pericardial friction rub developed. An electrocardiogram showed changes indicating acute pericarditis, with elevation and deformity of the R-T interval in all leads. This returned practically to normal a fortnight later; no evidence of cardiac infarction was present. He was then discharged, afebrile, but with a raised sedimentation rate, which persisted until he was last seen in February, 1949, when he complained of pains in the occiput, sterno-mastoid, thigh, and deltoid muscles. The heart appeared normal clinically and by electrocardiography and cardioscopy.

Case 2

A man aged 37 was seen on Jan. 19, 1949. Following moderate exposure and mild malaise, and after a heavy meal, he developed epigastric pain while driving his car. This grew

more severe and paroxysmal, extending from the xiphisternum upwards to the suprasternal notch, passing outwards to the pectoral regions and posteriorly to the interscapular region at the level of the sixth dorsal vertebra. Although no abnormal clinical signs of any kind were found, repeated injections of "omnupon" and pethidine were necessary.

By the next morning the patient felt practically recovered, but during this second day fever of 101° F. (38.3° C.) developed, and a loud but painless pericardial friction rub became audible. An electrocardiogram showed the changes of acute pericarditis, with elevation and deformity of the R-T interval in the limb leads and chest leads CR1 to CR7, maximal in II and CR3. Friction disappeared in 24 hours and fever in 48 hours. After a fortnight the heart was clinically and cardioscopically normal, but there was still slight elevation of the R-T interval, maximal in II and CR4. After a further seven weeks, when the patient had been working for a month, slight elevation of R-T in CR4 alone remained.

Comment

Both cases were at some stage, and with justification, diagnosed clinically as cardiac infarction. Apart from differential diagnosis, the general question of their mechanism may be raised. As will be observed from the earlier references, none has been suggested. It is also noted by Wolff (1944) that the prognosis is good, as is implicit in the terms "non-specific," "obscure," or "idiopathic" used by other authorities, since fatalities and necropsies would be likely to lead to some conclusion regarding their cause. A bacterial origin seems unlikely, since duration is brief and sequelae are rare. The cases cannot be regarded as "a chief manifestation of an infective process" (Lewis, 1946), such as acute rheumatism (Evans, 1948).

Another possibility arises, however, when the group simulating cardiac infarction is considered. The most likely simulator of a vascular lesion is another vascular lesion. In Case 1 there is evidence of activity of temporal or giant-cell arteritis, now recognized as a generalized process (Cooke *et al.*, 1946). The possibility has been suggested that this may affect the coronary vessels (Cole, 1948) or other large vessels (B.M.J., 1949). A reasonable explanation of the pericarditis in Case 1 seems to be arteritis of the vessels supplying the pericardium—branches of the internal mammary vessels or descending aorta—producing a pericardial infarction. Pericarditis or subepicardial infarction is known to occur in some cases of coronary occlusion, so that vascular lesions can produce such changes. On the other hand, they are not invariable in coronary disease, so that the subepicardial muscle derives part of its blood supply from elsewhere. The vessels providing the supply may be those damaged by the arteritis in Case 1, and possibly in "idiopathic" Case 2 some chance lesion may also have affected them. The rarity of an obvious general cause may be due to the fact that when there is generalized arterial disease the coronary vessels, exposed to constant and severe stresses in unintermittent response to changes in the internal and external environment, will fail earlier than the relatively sheltered vessels of the pericardium. These, on the other hand, may suffer from such diseases of capricious local incidence as temporal arteritis.

Summary

Two cases of acute pericarditis simulating cardiac infarction are reported, one associated with temporal arteritis. Pericardial infarction is suggested as a responsible mechanism.

REFERENCES

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