POLYARTERITIS NODOSA WITH NEW BONE FORMATION

PAUL D. SAVILLE, LONDON, ENGLAND

From the Institute of Orthopaedics and the Royal National Orthopaedic Hospital

Polyarteritis nodosa was first described as a clinicopathological entity by Kussmaul and Maier (1866), who called it periarteritis nodosa. Ferrari (1903) first called the disease polyarteritis nodosa, a name that describes the pathology more accurately.

The disease may be grouped with the collagen diseases—desseminated lupus erythematosus, scleroderma, rheumatoid arthritis and others. It is characterised by patches of acute inflammation, necrosis of cells and fibrinoid changes in the collagen fibres of small and medium-sized arteries. The symptoms depend either on ischaemic changes in the tissues supplied by the affected vessels or to rupture of vessels. It is not surprising, therefore, that symptoms referable to practically every system and organ have been described alone or in combination. It is the presentation of symptoms from disease processes involving many systems in a bizarre fashion that usually suggests the possibility of the diagnosis. Arthralgia is common but arthritis rare (Lowman 1952). The medical literature is well reviewed in English by Curtis and Coffey (1934), Harris, Lynch and O'Hare (1939), Miller and Daley (1946) and Nuzum and Nuzum (1954). None refers to affection of bone in this disease. The opportunity is taken of reporting a case of polyarteritis nodosa, the presenting and only symptoms of which were pain and swelling of the shins with subperiosteal new bone formation. Investigations including biopsy are recorded, as well as the response to treatment.

CASE REPORT

A man of fifty-eight, a bank messenger, had been perfectly fit until November 1953, when he noticed redness of the skin over his right shin. At first this was painless and seemed to subside after ten days. Four months later swelling became localised to the middle third of the right tibia and a similar condition appeared in the left leg. He now had severe throbbing pain in the lower part of both legs which kept him awake at night. It was aggravated by standing or walking, so that he was unable to work or to get about the house. Otherwise, his general health was good.

There was no significant family history except that one brother had died of diabetes mellitus. He had had no serious illness in his life but had travelled throughout the Far East during the 1914–1918 war.

TABLE I

Routine Blood Examination

<table>
<thead>
<tr>
<th>Date</th>
<th>Haemoglobin (per cent)</th>
<th>P.C.V.</th>
<th>E.S.R.</th>
<th>W.B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.54</td>
<td>108</td>
<td>50</td>
<td>19</td>
<td>7,200</td>
</tr>
<tr>
<td>4.54</td>
<td>—</td>
<td>43</td>
<td>30</td>
<td>7,000</td>
</tr>
<tr>
<td>3.7.54</td>
<td>101</td>
<td>41</td>
<td>34</td>
<td>8,000</td>
</tr>
<tr>
<td>10.7.54</td>
<td>—</td>
<td>38</td>
<td>44</td>
<td>8,500</td>
</tr>
<tr>
<td>8.54</td>
<td>—</td>
<td>45</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>9.54</td>
<td>74</td>
<td>43</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>10.54</td>
<td>103</td>
<td>45</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>11.54</td>
<td>101</td>
<td>46</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>6.55</td>
<td>—</td>
<td>—</td>
<td>14</td>
<td>Cortisone therapy</td>
</tr>
</tbody>
</table>

vol. 38 b, no. 1, february 1956

327
Examination revealed a heavily built plethoric middle-aged man. The blood pressure was 190/120. The heart was not clinically enlarged. Fundi showed Grade I hypertensive changes. Pitting oedema was present over the dorsum of both feet. There was some swelling, redness and heat over the subcutaneous border of the tibiae, over the upper two-thirds, worse on the right. This area was tender to pressure. The skin was adherent to bone and was desquamating on the right. There were no other abnormal signs in any system.

_Radiographs_—No active lesion was seen in the lung fields. The affected bones are shown in Figures 1 to 5.

*Pathological investigations*—The blood Wassermann and Kahn reactions were repeatedly negative. Agglutinations against the salmonella group and brucella group of organisms were repeatedly negative. The results of routine blood examinations are shown in Table I.

Serum calcium, phosphate and alkaline phosphatase were all normal. Blood urea 24 milligrams 100 millilitres. Urea clearance 63 per cent of normal. Serum ascorbic acid 0.6 milligrams 100 millilitres. After 800 milligrams of ascorbic acid by mouth, serum levels rose to 1.7 milligrams 100 millilitres. It was concluded that he did not suffer from scurvy.
The urine repeatedly showed a trace of albumen and an occasional red cell and pus cell.

Biopsy—A segment of fibula with adjacent soft tissue was taken. Macroscopically the subcutaneous tissue appeared oedematous and the muscle was pale and contained small gelatinous areas. The histology showed polyarteritis. The biopsied muscle showed atrophy of fibres and diffuse fibrosis (Fig. 6). There was marked patchy infiltration of the tissue with inflammatory cells—chiefly lymphocytes and plasma cells, but also neutrophil and eosinophil polymorphs. Some of the inflammatory cells were situated in the interstitial connective tissue of muscle bundles; many were in the perivascular tissue surrounding small blood vessels (Fig. 7). Occasionally the walls of small arteries were involved by the lesions, all layers containing inflammatory cells and showing varying degrees of destruction (Figs. 8 and 9). A considerable amount of periosteal new bone was present on the surface of the fibula (Figs. 10 and 11). The deeper cortical bone was histologically normal, and neither the newly formed bone nor the adjacent periosteal tissues showed involvement by inflammatory lesions.

**DISCUSSION**

Polyarteritis nodosa may occur at any age, the youngest recorded case being in the first month of life (Wilmer 1945), but in the 175 cases reviewed by Nuzum and Nuzum (1954) the average age was 41.5 years and males predominated over females in the ratio 4:1. The patient whose case is reported in this paper also had hypertension, which probably occurs in more than half the cases and is due to renal involvement, which manifested itself in this case by albuminuria and diminished urea clearance. The unique feature was the new bone formation which was bilateral and presumably due to stimulation of the periosteum by the arthritis in the surrounding muscles. The bone and periosteum were not directly involved.

The etiology of the disease is uncertain. The present trend is to regard it as a hypersensitivity reaction. Cases have been reported after serum sickness (Rich 1942), iodine treatment of goitre (Rich 1945) and organic arsenicals (Miller and Nelson 1945). Asthma was associated with the disease in 18 per cent of the cases reviewed by Wilson and Alexander (1945). Polyarteritis nodosa has been experimentally produced in rabbits by establishment of an anaphylactic state analogous to human serum sickness (Rich and Gregory 1943). The disease, then, seems to be related to allergy—immunity mechanism in general. There was nothing in the history of this patient, however, to suggest an allergic illness, neither had he taken any drugs to which he might have become sensitised.

With all this evidence suggesting that the disease is in the nature of a hypersensitivity reaction, it would seem reasonable to treat it with corticotrophin or cortisone. Most authorities are agreed that the disease is usually fatal, although Miller and Daley (1946) demur in this belief, and suggest that mild chronic and localising cases, such as two they describe, are often missed. Baggenstoss, Shick and Polley (1951) reported two cases treated with cortisone, in which there were remission of symptoms and lowering of the erythrocyte sedimentation rate on administration of the drug, with partial relapse on stopping treatment and further remission on restarting it. Lovell and Rose (1955) reported eight patients observed
FIG. 6
Muscle atrophy and fibrosis of the affected muscle. (H. and E., × 150.)

FIG. 7
Muscle. Tissue infiltration with inflammatory cells, showing the perivascular distribution. (H. and E., × 150.)
FIG. 8
Muscle. Small artery showing complete disorganisation of wall by inflammatory tissue. (H. and E., × 150.)

FIG. 9
Muscle. Small artery. The subintimal connective tissue of the vessel wall shows fibrinoid degeneration. (Phospho-tungstic acid haematoxylin, × 150.)
Fig. 10
Fibula. Slab-radiograph of resected tissue, showing conspicuous periosteal new bone. (× 4½.)

Fig. 11
Fibula. Periosteal new bone, showing the absence of any inflammatory lesions in this tissue. (H. and E., × 35.)
for five years and treated with large doses of cortisone aimed at complete suppression of the disease. Two patients died during treatment from malignant hypertension, three patients were in remission and three patients still required cortisone. These authors stress the danger of renal lesions and the importance of early diagnosis and complete suppression of the disease in order to prevent further renal involvement which is irreversible.

The patient whose case is reported in this paper has not had enormous doses of cortisone. His erythrocyte sedimentation rate is down but still slightly above normal. At the same time, on 75–100 milligrams of cortisone daily, the patient’s symptoms have resolved completely and he is able to do a full day’s work; he has not been troubled by any of the unpleasant side effects of cortisone. Now he feels well and his diastolic blood pressure is about 20 millimetres lower than it was a year ago.

SUMMARY

1. A case of polyarteritis nodosa is reported, the presenting manifestation of which was subperiosteal new bone formation in both legs.
2. The effect of cortisone on the symptoms is recorded.
3. The histology is reported after biopsy of bone and adjacent tissue.
4. Skeletal involvement in polyarteritis nodosa is believed to be hitherto unrecorded.

I wish to thank Mr H. Jackson Burrows for permission to publish this case and Dr H. A. Sisson for the photomicrographs and the histological report.

REFERENCES

HARRIS, A. W., LYNCH, G. W., and O’HARE, J. P. (1939): Periarteritis Nodosa. Archives of Internal Medicine, 63, 1,163.
RICH, A. R. (1942): The Role of Hypersensitivity in Polyarteritis Nodosa as Indicated by Seven Cases Developing During Serum Sickness and Sulfonamide Therapy. Bulletin of the Johns Hopkins Hospital, 71, 123.