Bannwarth's Syndrome (Lymphocytic Meningoradiculitis) in Sweden

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Lymphocytic meningo-radiculitis of Bannwarth is often associated with a tick bite and erythema chronicum migrans, and therefore may be a European counterpart of Lyme disease in North America. Of nine patients with lymphocytic meningo-radiculitis studied at the Neurologic Clinic in Lund, Sweden, six were found to have elevated antibody titers to the Lyme spirochete. These studies support the conclusion that the two diseases are related and may be overlapping sectors of a larger clinical spectrum caused by one infectious agent.

In 1922, Garin-Bujadoux [1] described a patient who developed neurological involvement and meningitis following a tick bite and skin lesion. The skin lesion was most likely erythema chronicum migrans (ECM), a condition first observed in 1908 by Afzelius [2]. A similar case was subsequently published by Hellerström [3].

Based on observations in 26 patients, Bannwarth, in 1941 [4] and 1944 [5,6], described a clinical picture characterized by protracted lymphocytic meningitis, neuralgia, and neuritis involving particularly the facial nerves. None of the patients had a documented tick bite (one had been stung by an insect), and probable ECM was found in only two or three of them. However, subsequent European investigators have often noted this syndrome to be associated with a tick bite and ECM [7–10]. Therefore, it is probably closely related to the early cases of Garin and Bujadoux and of Hellerström. The condition has been described under various names, including tick-borne meningopolyneuritis (Garin-Bujadoux, Bannwarth) [9] and the term used here, lymphocytic meningo-radiculitis (Bannwarth's syndrome) [10]. Most cases have been reported from Central Europe, and despite some early reports (e.g., [11]), this disorder remained fairly unknown in Scandinavia until recently [12,13].

We studied nine patients with lymphocytic meningo-radiculitis at the Neurologic Clinic in Lund, Sweden (Table 1). All patients had CSF abnormalities, including protein elevation, relative IgG increase, and oligoclonal bands. A lymphocytic pleocytosis with plasma cells and occasional granulocytes was regularly found (Fig. 1). In collaboration with W. Burgdorfer and A.G. Barbour (Rocky Mountain Laboratories, Hamilton, Montana), we assayed serum and CSF for antibodies to a spirochete isolated from an American patient with Lyme disease (Table 1) [14]. Six of the nine patients had high antibody titers in serum, whereas antibodies of low titer were found in only one of 12 healthy controls (Table 2) [15].

Because of common features such as tick vector, ECM, and neurologic manifesta-

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TABLE 1
Clinical Features of Nine Swedish Patients with Lymphocytic Meningoradiculitis Assayed for Antibodies to the Lyme Disease Spirochete

| Patient No. | Duration of Disease | Tick or Insect Bite | ECM | General Symptoms | Headache | Other Pain | Slight Neck Stiffness | Slight Fever | Sensory Disturbance | Cranial Nerves Involved | Limb Weakness |
|-------------|---------------------|---------------------|-----|------------------|----------|------------|----------------------|--------------|---------------------|------------------------|--------------|
| 1           | 3 m                 | +                   | -   | +                | +        | +          | –                    | –            | –                   | VII                    | –            |
| 2           | 1 m                 | –                   | –   | –                | +        | –          | –                    | –            | –                   | VI, VII                | –            |
| 3           | 3 d                 | +                   | +   | –                | –        | +          | –                    | –            | –                   | V, VII, VIII           | R. arm       |
| 4           | 17 m                | –                   | –   | –                | +        | +          | –                    | –            | +                   | X                      | –            |
| 5           | 1 m                 | –                   | –   | +                | +        | –          | +                    | +            | +                   | V, VII, diplopia       | –            |
| 6           | 3 w                 | –                   | –   | +                | –        | –          | +                    | –            | –                   | Both legs             | –            |
| 7           | 8 m                 | +                   | –   | +                | –        | –          | –                    | –            | –                   | III, VI, VIII, XII     | –            |
| 8           | 5 m                 | –                   | –   | –                | +        | –          | –                    | +            | –                   | VII                    | –            |
| 9           | 3.5 m               | –                   | –   | +                | +        | –          | –                    | –            | +                   | VII                    | L. leg        |

m, month(s)  d, days  w, weeks
| Patient No. | CSF Findings | Serum Antibody Titer | CSF Antibody Titer | IgG | IgM | IgG |
|-------------|--------------|----------------------|-------------------|-----|-----|-----|
| 1           | 177 Mono +   | 1.20                 | 1.05              | 4/1 | +   | +   |
| 2           | 222 Mono +   | 1.73                 | 1.78              | 4/1 | +   | +   |
| 3           | 35 Mono +    | 0.26                 | 0.42              | 4/1 | +   | +   |
| 4           | 232 Mono +   | 3.19                 | 4.25              | 4/1 | +   | +   |
| 5           | 443 Mono +   | 1.64                 | 0.79              | 4/1 | +   | +   |
| 6           | 139 Mono +   | 2.20                 | 1.64              | 4/1 | +   | +   |
| 7           | 95 Mono +    | 1.83                 | 1.94              | 4/1 | +   | +   |
| 8           | 7 Mono +     | 0.92                 | 0.57              | 4/1 | +   | +   |
| 9           | 33 Mono +    | 0.61                 | 0.48              | 4/1 | +   | +   |

*Upper normal limit, 0.45 g/l.*

†Upper normal titer, 1:24.

[Table 2: CSF Findings and Result of Assay for Antibodies to the Lyme Disease Spirochete (Human Blood ISolate HB 19)]

Of 12 control sera all were negative in the antibody assay except one which showed a low level (1:24) of IgM antibodies.
tions, a close relationship between lymphocytic meningoradiculitis and Lyme disease has been suspected. Our patients were similar clinically to those in other European studies of lymphocytic meningoradiculitis [1-13,16] and to those with neurologic abnormalities of Lyme disease [17,18]. In addition, the finding of antibodies to the Lyme disease spirochete in six of our nine patients indicates infection by an agent closely related to or identical with the spirochete that causes Lyme disease in North America. The existence of such an agent in Europe is further supported by the recent demonstration of antibodies to the Lyme disease spirochete in two cases of Lyme disease in France [19] and in Swiss patients with ECM [20]. Moreover, spirochetes isolated from *Ixodes ricinus* ticks collected in Switzerland [20,21] have immunologic and morphologic similarities to the spirochetes isolated from American Lyme disease patients [12,22].

Despite obvious similarities, there seem to be certain differences between the diseases in North America and Europe. Most patients with Lyme disease lack neurologic involvement [17], whereas all patients with Bannwarth's syndrome, by definition, have CSF abnormalities and neurologic signs and symptoms [9,10]. Joint involvement is frequently reported in Lyme disease [17,23], but is lacking in most cases of Bannwarth's syndrome [4-13,16]. Most European patients have only one isolated ECM, but multiple skin lesions have been observed in a considerable proportion of American Lyme disease patients [23]. Moreover, compared to European cases, the encephalitic component seems to be more pronounced in American Lyme disease [18] if the nervous system is involved.

These differences might be explained by different pathogenic properties in regionally restricted strains of the Lyme disease spirochete or, possibly, by the intriguing fact that this spirochete is sometimes infected by a bacteriophage [24]. However, selection bias may explain some differences in the clinical profile in the various studies. When the same criterion of inclusion was used, the occurrence of ECM, strikingly similar clinical profiles were seen in European [25] and American [23] studies. The ECM-associated disease panorama, therefore, seems to be very similar in the two continents.
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