

Cutaneous manifestations of tick-borne (Lyme) borreliosis

Cutaneous changes characteristic of European tick-borne borreliosis are erythema migrans, borrelial lymphocytoma and acrodermatitis chronica atrophicans.

Erythema migrans (bull's eye rash)

Erythema migrans is regarded as the principal symptom of the early phase of tick-borne borreliosis. Reddening of the skin gradually spreads centrifugally, often proceeding from a reddened nodule or a livid swelling, and originating in the region of the bite of a hard tick (usually the castor bean tick, *Ixodes ricinus*, in Europe), days or weeks (average: 10 days) after the bite, due to the transmission of *Borrelia*. The initially homogeneous erythema may fade from the centre outwards. Then only a constantly expanding curved margin remains visible. The bends of joints in particular are frequently affected by tick bites, including the armpits and the genito-crural region. In the case of women in particular, the nipple and areola are affected, and in men the skin of the scrotum. Nodular borrelial lymphocytomas often develop in the latter areas of skin as well. Dissemination of the pathogens via the blood and lymph can cause the development of both regional and generalised swelling of the lymph nodes as well as multilocular erythemas of varying number and size on any part of the integument. Erythema migrans often remains symptomless, but may be accompanied by local pruritus, or less commonly by a feeling of warmth or burning pain.

The erythema may persist for varying lengths of time and with changing intensity, for weeks to many months, but on average it clears spontaneously after about 10 weeks. About two thirds of patients affected mention the general symptoms that accompany or precede the erythema migrans, which are similar to those of an influenza infection. These include exhaustion, headaches, conjunctivitis, transient migrating pains in the joints, myalgia like muscular pain after exertion and (usually only moderately) elevated body temperatures. If five or more early general symptoms of this sort or intense malaise are registered during the erythema, manifestations of the disease are also to be expected later, irrespective of the nature of treatment. Four species of *Borrelia* have been identified by molecular biology as causative agents of erythema migrans in Central Europe, including *Borrelia afzelii* in about 80% of cases, and less frequently *B. garinii*. *B. burgdorferi* in the strict sense, represented exclusively in North America, is rarely seen, and *B. spielmanii* occurs in isolated instances.

The diagnostic and therapeutic approach:

The clinical picture and the development of erythema migrans are usually so characteristic, given a corresponding previous history (exposure to ticks), that the attempt to confirm the diagnosis by identifying the pathogen or determining serum antibodies can almost always be omitted in favour of rapid antibiotic therapy.

Borrelial lymphocytoma (former name: lymphadenosis cutis benigna)

A bright reddish nodular swelling usually appearing during the early phase of a borrelial infection in the region of the tick bite.

This may form the centre of the erythema migrans. It affects predominantly regions of soft well-perfused skin. Sites of predilection are the nipples and large labia in women, and the skin of the scrotum in men. In children, borrelial lymphocytomas are often seen on the external ear and earlobes. In approx. 25% there is regional lymph node swelling. In contrast to malignant B-cell lymphomas, borrelial lymphocytomas contain B and T lymphocytes of polyclonal origin and plasma cells with immunoglobulin formation of the kappa and lambda type. As regards the causative agent, it is mainly *B. afzelii* which is detected in cases of borrelial lymphocytomas.

Acrodermatitis chronica atrophicans (ACA)

The name acrodermatitis chronica atrophicans coined in 1902 applies to skin changes in the chronic late stage of a borrelial infection. They preferentially develop mainly at the joints on the distal extensor sides of the limbs, i.e. above the knees and dorsum of the foot or elbows and backs of hands, usually unilaterally at first. The trunk and skin of the face are rarely affected. The oedematous-infiltrative early phase of ACA is characterised by dough-like swellings and livid discolouration of the areas of skin affected. As time goes on, an increasing atrophy of the cutaneous and subcutaneous tissue gradually develops with degeneration of the collagen and elastic connective tissue fibres and of the sweat glands and hair follicles. The livid reddish atrophic skin may appear as thin as cigarette paper and folded over the extensor surfaces, and wrinkled and brownish coloured on the soles of the feet ("parchment skin"). A special form of acrodermatitis can appear on the skin of the buttocks and thighs, less commonly on the upper arms and across the large joints, as dermatitis atrophicans maculosa affecting small areas with macular anetoderma as an atrophic final stage. On the extensor surfaces of the forearms, less commonly on the lower legs, stripes of reddening and strands may develop as ulnar or tibial stripes. Hard, ivory-coloured dermatosclerotic plaques with taut skin thickened like armour-plating are known as "pseudoscleroderma". Hard, juxta-articular fibroid nodes may form on the extensor sides of the joints, especially over the elbows. As the cutaneous manifestation of a chronicised systemic infection, the acrodermatitis may be accompanied by regional, less commonly also generalised lymph node swelling. About 50% of patients develop peripheral neuropathy. Joint involvement may manifest itself in arthritis and arthritis deformans-like subluxations of the little finger and toe joints. Muscle weakness and pain, occasionally followed by muscular atrophy may be the clinical equivalent of myositis. Lyme encephalopathy may manifest itself in chronic exhaustion and cognitive disturbance such as poor concentration and memory, or occasionally in depression and behavioural changes as well.

The causative agent in acrodermatitis chronica atrophicans was found almost exclusively to be *B. afzelii*. In patients with acrodermatitis chronica atrophicans confirmed by characteristic clinical and histological cutaneous findings and by microbiological culture or molecular biological diagnostic tests, markedly elevated specific IgG antibody titres have been found in every case to date, and IgM antibodies against *B. burgdorferi* have also been found in about 40% of patients.