

Lyme Neuroborreliosis

Diagnosis and Treatment

Akademisk avhandling

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av

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This thesis is based on the following studies

- I. Bremell D, Hagberg L. Clinical characteristics and cerebrospinal fluid parameters in patients with peripheral facial palsy caused by Lyme neuroborreliosis compared with facial palsy of unknown origin (Bell's palsy). *BMC Infectious Diseases*. 2011;11:215.
- II. Bremell D, Mattsson N, Edsbacke M, Blennow K, Andreasson U, Wikkelsö C, Zetterberg H, Hagberg L. Cerebrospinal fluid CXCL13 in Lyme neuroborreliosis and asymptomatic HIV infection. *BMC Neurology*. 2013;13:2.
- III. Bremell D, Mattsson N, Wallin F, Henriksson J, Wall M, Blennow K, Zetterberg H, Hagberg L. Automated cerebrospinal fluid cell count - New reference ranges and evaluation of its clinical use in central nervous system infections. *Clinical Biochemistry*. 2014; 47(1-2):25–30.
- IV. Bremell D, Dotevall L. Oral doxycycline for Lyme neuroborreliosis with symptoms of encephalitis, myelitis, vasculitis or intracranial hypertension. *European Journal of Neurology*. Epub ahead of print.

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UNIVERSITY OF GOTHENBURG

Lyme Neuroborreliosis

Diagnosis and Treatment

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Abstract:

Lyme neuroborreliosis, the infection of the nervous system by the tick-borne bacterium *Borrelia burgdorferi*, is a common infection in the temperate parts of the Northern hemisphere. Manifestations of the disease include facial palsy, radicular pain, sensory disturbances, and occasionally CNS symptoms such as confusion and paraparesis. The diagnosis of Lyme neuroborreliosis is based on medical history, clinical examination and cerebrospinal fluid (CSF) analysis. Recommended antibiotic treatment is oral doxycycline or intravenous ceftriaxone. The overall aims of this thesis were to improve the diagnosis and treatment of Lyme neuroborreliosis.

In **paper I**, 102 patients with peripheral facial palsy were studied. Onset of symptoms in July to October, additional neurological symptoms and CSF pleocytosis were factors that discriminate patients with peripheral facial palsy caused by Lyme neuroborreliosis from patients with Bell's palsy.

In **paper II**, it was shown that CSF levels of the chemokine CXCL13 are highly elevated in Lyme neuroborreliosis and that levels decline after treatment, but high and overlapping CXCL13 levels were also seen in patients with asymptomatic HIV-infection and the decrease in CXCL13 is correlated to the decrease in CSF cell count. The additional diagnostic value of CXCL13 analysis is therefore limited.

In **paper III**, new reference ranges for CSF cell counts when analyzed with automatic cell counters were determined, based on CSF sampling of 80 healthy volunteers. The differentiation of mononuclear cells into lymphocytes and monocytes was shown to be of limited value in the discrimination between Lyme neuroborreliosis and viral CNS infections.

In **paper IV**, it was shown that treatment with oral doxycycline resulted in a similar decrease in CSF mononuclear cell counts in patients with Lyme neuroborreliosis with CNS symptoms compared with patients with peripheral nervous systems symptoms, and that all patients with CNS symptoms improved on treatment with no need for retreatment. Oral doxycycline can therefore be considered an effective treatment for Lyme neuroborreliosis, irrespective of the severity of symptoms

Keywords: Lyme disease, Lyme borreliosis, Lyme neuroborreliosis, *Borrelia burgdorferi*, facial palsy, doxycycline, chemokine CXCL13, cell count.

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